SPECIAL DISK OFFER! See p. 6.

February 1990

The Great Design-a-Robot Contest

COMPUTE!'s GAZETTE™ FOR USERS COMMODORE 64/128

02220

CLUB CARIBE

QLink's Hot Online Resort

8 EXCITING PROGRAMS INSIDE!

SOUND SAMPLER 64
Master the SID chip with a joystick

QEWB
An electronic jigsaw puzzle with a twist

MESSENGER
Send friends animated text files

NEURAL NETWORKS
Teach your computer a lesson

PLUS
Font Magic
GEOS: DirQuick

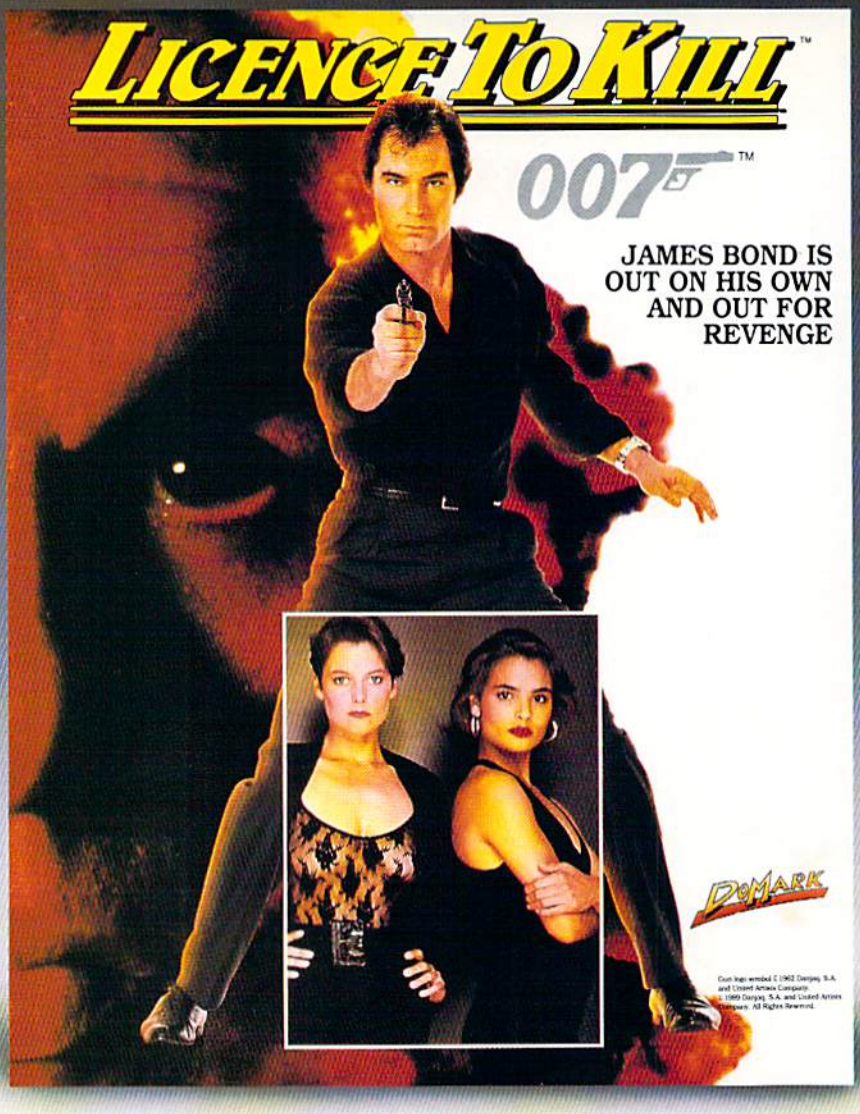
DISK EDITOR
Explore and alter 1541/1571 disks

And more!

USA $2.95 Canada $3.50

02

0 71486 02220 6



Meet the newest James Bond. You!

James Bond is back with a vengeance in *Licence to Kill*, the movie. But in *this* adventure, you're the star.

The powerful drug czar Sanchez has murdered your best friend's bride. So you're out to take him down. Show no mercy as you battle him on land, at sea and in the air.

You'll need to take the controls of helicopters, planes and tankers. Perform death-defying stunts in midair. Even water-ski in your bare feet!

Critics are already raving about this exciting new 007 game.

"All sections are nicely designed, and faithfully follow scenes from the film—just like a movie licence should." ***• Computer & Video magazine***

"At last, a Bond game that will be appreciated by 007 fans and arcade addicts alike." ***• The One magazine***

Licence to Kill. It's a killer game!

- *Six dangerous levels.*
- *Movie-like story line and action.*
- *Colorful graphics and animation.*

DOMARK™

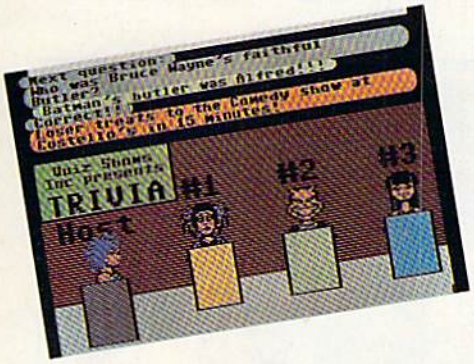
Distributed By
Brøderbund®

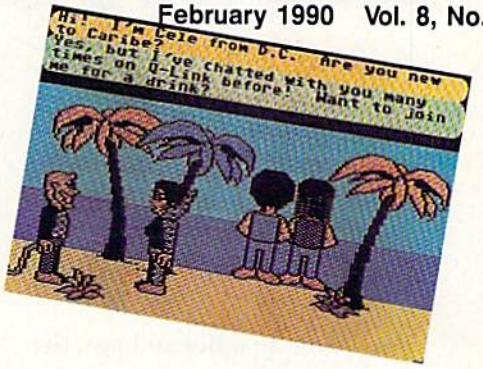
See your dealer or call Brøderbund at (800) 521-6263 to order.

089 © Copyright 1989 Brøderbund Software, Inc. and Domark, Ltd. Brøderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101. All Rights Reserved. 16LCG

GAZETTE contents

February 1990 Vol. 8, No. 2





Features

Club Caribe
An Unabashed Tour of an Online Resort
Tom Netsel ..... 23 *

The 64—Hot or Cold?
Tom Netsel ..... 30 *

Future Computing:
Part 2—Neural Networks
Kevin E. Martin ..... 34 *

Reviews

Fire King
Romney Laanstra 63 64

Omni-Play Basketball
Robert Bixby 63 64

Might and Magic II
Jeff Seiken 64 64

SimCity
Steve Hedrick 64 64

BattleTech
Len Poggiali 65 64

Kings of the Beach
Heidi E. H. Aycock 66 64

Games

Qewb
Robert Bixby ..... 40 64 EDITOR'S CHOICE

Pinhead
James Merlo 46 64

Programming

Power BASIC: *Font Magic*
Shao-Tien Pan 10 64

The Programmer's Page: Bugs
Randy Thompson 20 128/64

BASIC for Beginners:
More Lesser-Known Commands
Larry Cotton 21 64

Disk Editor
Stacy J. Prowell 49 64

Sound Sampler 64
Guy Johnson 54 64

Messenger
Stephane Edwardson ..... 58 64 EDITOR'S CHOICE

Machine Language Programming:
A Word Counter
Jim Butterfield 70 128/64

Departments

The Editor's Notes
Lance Elko ..... 5 *

Feedback
Editors and Readers ..... 7 *

Letters to the Editor ..... 9 *

The GEOS Column: *DirQuick*
John P. Young 14 128/64

Horizons:
Send Me Mail
Rhett Anderson ..... 18 *

D'Iversions:
Design-a-Robot Contest
Fred D'Ignazio ..... 19 *

Commodore Clips:
News, Notes, and New Products
Mickey McLean ..... 79 *

Typing Aids

The Automatic Proofreader 71 128/64

How to Type In *COMPUTE!'s Gazette* Programs ..... 72 *

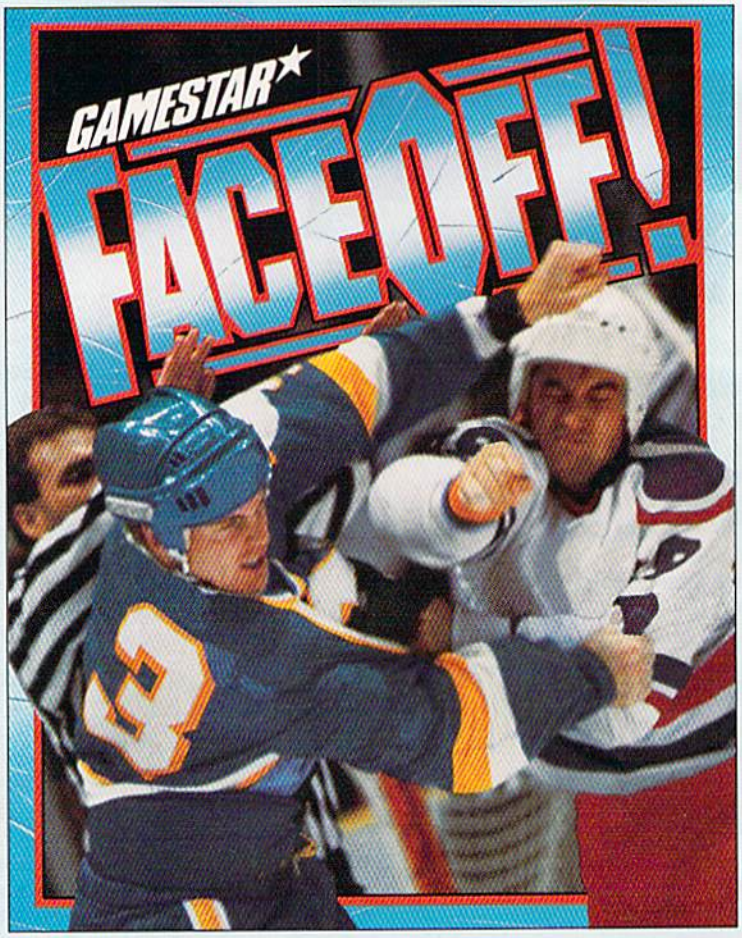
***MLX:* Machine Language Entry Program for Commodore 64** 74 64

Advertisers Index ..... 71 *

64 = Commodore 64, **128** = Commodore 128, * = General

COMPUTE!'s Gazette (ISSN 0737-3716) is published monthly by COMPUTE! Publications, Inc., ABC Consumer Magazines, Inc., Chilton Company, one of the ABC Publishing Companies, a part of Capital Cities/ABC, Inc., 825 Seventh Ave., New York, NY 10019. © 1990 ABC Consumer Magazines, Inc. All rights reserved. Editorial offices are located at Suite 200, 324 West Wendover Ave., Greensboro, NC 27408. Domestic subscriptions: 12 issues, $24. POSTMASTER: Send Form 3579 to COMPUTE!'s Gazette, P.O. Box 3255, Harlan, IA 51537. Second-class postage paid at New York, NY, and additional mailing offices.

"I Went to the Fights and a Hockey Game Broke Out."



Hockey is war on ice. Players travel over 30 miles an hour, the puck over 100. *FaceOff!* captures the beauty and brutality of hockey. When you see it, you'll understand why GAMESTAR—the leading sports software publisher—waited to do it right.

FaceOff! features the largest animated players, a hands-on full-screen fight mode, and a close-up Shot Cam. With complete league and general manager features. It's hockey the way it was meant to be—fast, furious, and violent.

Take No Prisoners
When the goon squad hits the ice, yank your hotshots before they're ice-spots.

Don't Get Mad, Get Even!
Slug it out as the Fight Cam zooms in. Better fight coverage than TV.

GAMESTAR

See your local retailer, or call 1-800-227-6900 to order.

©1989 GAMESTAR. IBM screens shown; screens may vary depending on computer system.
IBM is a trademark of International Business Machines Corp.

Circle Reader Service Number 106

COMPUTE!'s GAZETTE FOR USERS
COMMODORE 64/128

COMPUTE! PUBLICATIONS
Group Vice President, Publisher/Editorial Director — William Tynan
Associate Publisher/Editorial — Lance Elko
Associate Publisher/Advertising — Bernard J. Theobald, Jr.
Managing Editor — Kathleen Martinek
Editorial Operations Director — Tony Roberts
Senior Art Director — Janice R. Fary
Features Editor — Keith Ferrell
Editorial Marketing Manager — Caroline D. Hanlon
Manager, Disk Products — David Hensley

GAZETTE EDITORIAL DEPARTMENT
Associate Editor — Patrick Parrish
Art Director — Robin L. Strelow
Assistant Features Editor — Tom Netsel
Editorial Assistants — Elizabeth Casey, Mickey McLean
Assistant Technical Editor — Dale McBane
Program Designer — William Chin
Programming Assistant — Troy Tucker
Copy Editors — Karen Siepak, Karen Uhlendorf
Contributing Editors — Jim Butterfield (Toronto, Canada), Fred D'Ignazio (E. Lansing, MI), Larry Cotton (New Bern, NC)

ART DEPARTMENT
Mechanical Art Supervisor — Robin Case
Junior Designers — Scotty Billings, Meg McArn

PRODUCTION DEPARTMENT
Production Director — Mark E. Hillyer
Assistant Production Manager — De Potter
Production Assistant — Barbara A. Williams
Typesetting — Terry Cash, Carole Dunton
Advertising Production Assistant — Tammie Taylor

ADMINISTRATIVE STAFF
Executive Assistant — Sybil Agee
Senior Administrative Assistant — Julia Fleming
Administrative Assistant — Linda Benson
Customer Service Coordinator — Elfreda Chavis

ABC CONSUMER MAGAZINES, INC.
President — Gary R. Ingersoll
Senior Vice President — Richard D. Bay
Director, Financial Analysis — Andrew D. Landis
Director of Circulation — Harold Buckley

CIRCULATION DEPARTMENT
Subscriptions — Maureen Buckley, Beth Healy, Raymond Ward
Newsstand — Peter J. Birmingham, Jana Friedman

ABC Consumer Magazines, Inc.
CHILTON Company, One of the ABC Publishing Companies,
a part of Capital Cities/ABC, Inc.

Robert G. Burton, President
825 Seventh Avenue
New York, NY 10019

ADVERTISING OFFICES
New York: ABC Consumer Magazines, Inc., 825 Seventh Ave., New York, NY 10019. Bernard J. Theobald, Jr., Associate Publisher/Advertising, (201) 989-7553.
Greensboro: COMPUTE! Publications, 324 West Wendover Ave., Suite 200, Greensboro, NC 27408; (919) 275-9809. Kathleen Ingram, Marketing Manager.
New England & Mid-Atlantic: Bernard J. Theobald, Jr. (201) 989-7553. Kathleen Ingram (919) 275-9809.
Midwest & Southwest: Jerry Thompson, Lucille Dennis (312) 726-6047 [Chicago]; (713) 731-2605 [Texas]; (303) 595-9299 [Colorado]; (415) 348-8222 [California].
West, Northwest, & British Columbia: Jerry Thompson (415) 348-8222; Lucille Dennis (415) 878-4905.
Southeast & International: Bernard J. Theobald, Jr. (201) 989-7553, (212) 887-8402; Kathleen Ingram (919) 275-9809.
National Accounts Office
Midwest: Starr Lane, National Accounts Manager (312) 462-2872, 191 S. Gary Ave., Carol Stream, IL 60188-2089.

Address all advertising materials to Tammie Taylor, COMPUTE! Publications, Inc., 324 West Wendover Ave., Suite 200, Greensboro, NC 27408.

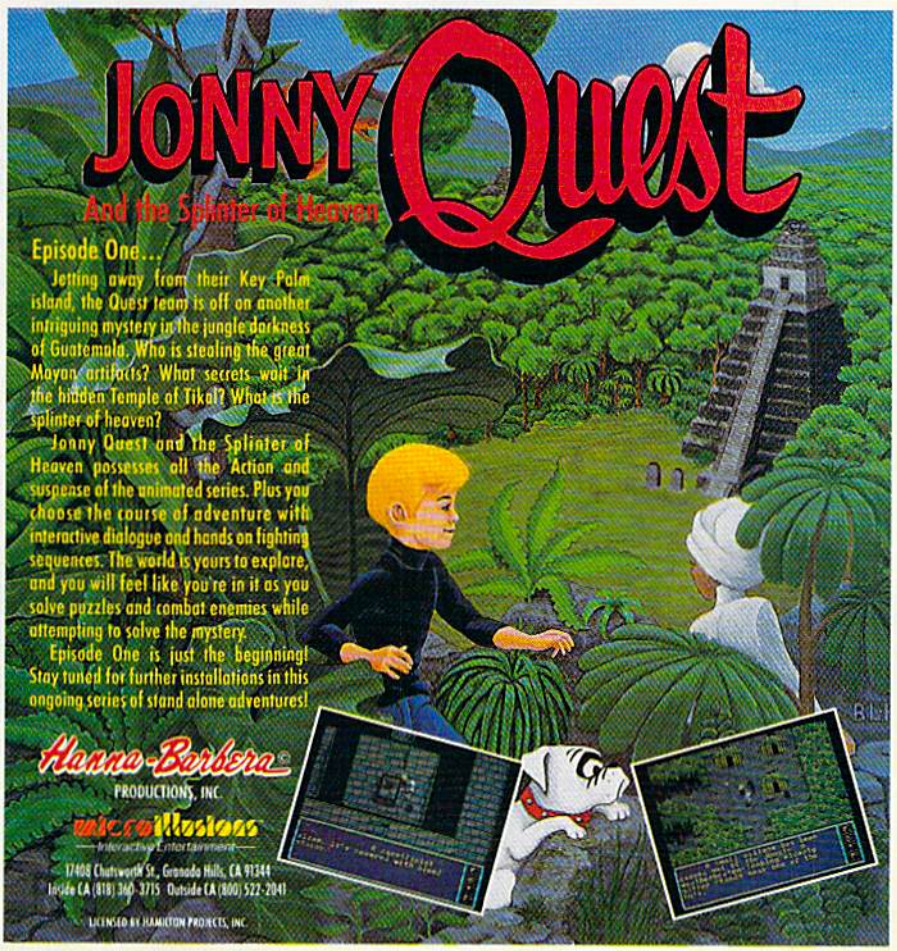
Editorial inquiries should be addressed to The Editor, COMPUTE!'s Gazette, Suite 200, 324 West Wendover Ave., Greensboro, NC 27408.

PRINTED IN THE U.S.A.

The Audit Bureau

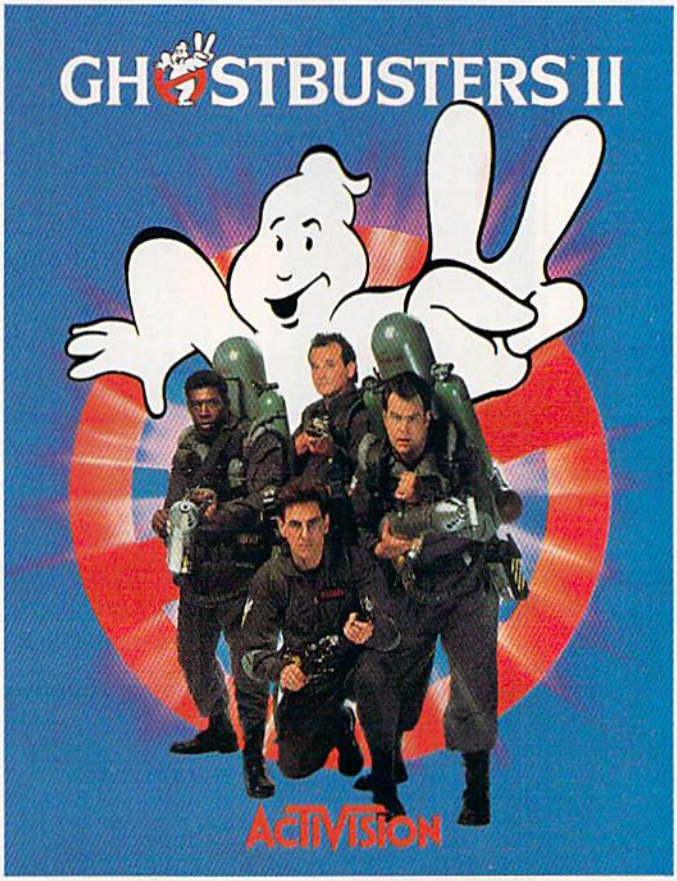
The Adventures of
SCOOBY-DOO
Play along with Scooby as he sniffs out three of his spookiest adventures ever!
Scooby Doo is an action packed arcade style game of sleuthing fun and adventure
for the whole gang. Its' fully explorable 3D worlds are filled with mysterious suspects, while exciting arcade sequences liven the mysteries with hair raising rides and chases!
©1990 Hanna-Barbera PRODUCTIONS, INC.
microillusions
—Interactive Entertainment—
17408 Chatsworth St., Granada Hills, CA 91344
Inside CA (818) 360-3715 Outside CA (800) 522-2041

Circle Reader Service Number 191

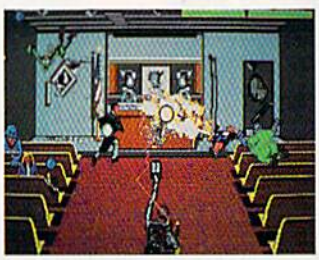

JONNY Quest
And the Splinter of Heaven
Episode One...
Jetting away from their Key Palm island, the Quest team is off on another intriguing mystery in the jungle darkness of Guatemala. Who is stealing the great Mayan artifacts? What secrets wait in the hidden Temple of Tikal? What is the splinter of heaven?
Jonny Quest and the Splinter of Heaven possesses all the Action and suspense of the animated series. Plus you choose the course of adventure with interactive dialogue and hands on fighting sequences. The world is yours to explore, and you will feel like you're in it as you solve puzzles and combat enemies while attempting to solve the mystery.
Episode One is just the beginning! Stay tuned for further installations in this ongoing series of stand alone adventures!
Hanna-Barbera
PRODUCTIONS, INC.
microillusions
—Interactive Entertainment—
17408 Chatsworth St., Granada Hills, CA 91344
Inside CA (818) 360-3715 Outside CA (800) 522-2041
LICENSED BY HAMILTON PROJECTS, INC.

Circle Reader Service Number 190

Bustin' Makes You Feel Good!



Who ya gonna call? The Ghostbusters—again.
Clear the courtroom of ghouls and get back in business. Bust your pals out of the insane asylum. Trap ghosts around New York City, then turn the slime to your side and march the Statue of Liberty across town to the Museum. If you've got the slimeblower, wasting the evil Vigo should be easy.



Get Ready to Believe Them.

Launch Miss Liberty on a rescue mission.

ACTIVISION

See your local retailer, or call 1-800-227-6900 to order.

©1989 Activision Software. Software ©1989 Dynamix Inc. Ghostbusters™ II logo ©Columbia Pictures Industries, Inc. All rights reserved.

Circle Reader Service Number 118

EDITOR'S notes

We've just returned from Las Vegas, where we spent several days at Fall COMDEX (COMputer Dealers EXposition). This trade show has grown tremendously since its start more than ten years ago—there were an estimated 115,000 attendees at this year's gathering. Nearly everyone in the hardware industry was there: IBM, Compaq, Sony, NEC, Toshiba, Hewlett-Packard, Panasonic, you name 'em. Commodore was there, touting its Amiga line. The show directory was as thick as a phone book. The number of exhibitors was so large that nine remote locations (hotels and sports complexes) were used to house the booths that wouldn't fit in the Las Vegas Convention Center. In fact, the COMPUTE! booth was grouped with 150 or so others in a baseball-stadium complex five miles from the convention center.

As you probably suspect, the focus of COMDEX is not on the 64 and 128. In my wanderings, I heard not one mention of either machine. If you're interested in mainframes, MS-DOS machines and compatibles, UNIX, desktop publishing, Macs, scanners, laser printers, LANs, workstations, high-resolution monitors, and so on, this is the place to be. New products are announced so fast that it makes your head spin.

As computer technology evolves faster than you can say *gigabyte*, you have to force yourself to stop, get your balance, and try to make sense of what's happening. Ziff Davis's venerable *PC Magazine* is turning away from coverage of PC XTs and even the faster ATs (or 286s). Last May, *PC Magazine* noted that it has been heralding the demise of the 80286 since early 1988. The newer 386 and 486 technology will be touted. *PC Magazine*'s claim that the AT (286) machine is passé technology is, in terms of state-of-the-art personal computing, true, of course.

To put things in perspective for the Commodore 64 and 128 user, consider this. The 64 has a clock speed of 1 MHz, and the 128 (in Fast mode) can run at 2 MHz. AT-class computers have a clock-speed range of 10–20 MHz. And *PC Magazine* is reportedly considering the AT to be a dinosaur. There's much more than clock speed to compare. We could contrast the differences between ATs and 64s or 128s in display resolutions, expandability, and so on. But the speed differences are enough to make the point here.

If ATs are being regarded as dinosaurs, what does that make 64s and 128s? Answer: That's the wrong question to ask. If you drive a Ferrari and travel in 55-mph speed zones, what's the point of owning it? Of course, the performance of 386-, 486-, or even 68000-based machines is a boon to computing technology. They're great machines—if you need that much computing power. But, if your 64 or 128 serves you well, if you're happy with your software, and if you're productive with your machine, that's all you need. Don't be lured by power you can't use.

We hear time and again from readers who use powerful PCs or full-blown Macs at work and are delighted to come home to their humble Commodore 8-bit machines. If you're a veteran Commodore user, you've invested a lot in hardware and software . . . not to mention time.

Trade shows like COMDEX are overwhelming. Here, the temptation for bigger, faster, and more powerful is reinforced by the minute. But reality beckons. You don't need a Ferrari when you drive 55.

Lance Elko

Lance Elko
Associate Publisher/Editorial

Circle Reader Service Number 189

GAZETTE DISK LIBRARY

VALUE-PACKED SOFTWARE AT AFFORDABLE PRICES

All *Gazette* disks are menu-driven for ease of use—and they feature complete documentation. Just load and you're ready to go!

SpeedScript **$11.95**
COMPUTE! Publications' most popular program ever. Powerful word processing package includes *SpeedScript* for the 64, *SpeedScript 128*, spelling checkers for both 64 and 128 versions, plus an additional dozen support programs, including mail-merge and word-count utilities.

Gazette's Power Tools **$9.95**
Fourteen of the most important utilities for the 64 ever published in *Gazette*. For serious users. Titles: *MetaBASIC, Disk Rapid Transit, Mob Maker, Ultrafont+, Quick!, Disk Editor, Basically Music, PrintScreen, 1526 PrintScreen, Fast Assembler, Smart Disassembler, Comparator, Sprint II,* and *Turbo Format.*

Best Gazette Games **$9.95**
Best dozen arcade and strategy games ever published in *Gazette* all on one disk. All games for Commodore 64. Titles: *Crossroads II: Pandemonium, Basketball Sam & Ed, Delta War, Heat Seeker, Omicron, Powerball, Q-Bird, Trap, Arcade Volleyball, Mosaic, Power Poker,* and *Scorpion II.*

Gazette Index **$7.95**
Every article and department from *Gazette*—July 1983 through December 1989 issues—is indexed: features, games, reviews, programming, Bug-Swatter, Feedback, and the other columns. Disk features pull-down menus, help screens, superfast searching/ sorting capabilities, and much more.

The GEOS Collection **$11.95**
Gazette's best 13 programs for GEOS and GEOS 128 users. Selection includes utilities, applications, and games. Titles: *Super Printer Driver, Skeet, File Saver, Help Pad, Word Count, Directory Printer, Quick Clock, SlideShow, File Retriever, Screen Dumper, Font Grabber, GeoPuzzle,* and *GeoConverter.*

128 Classics **$11.95**
Thirteen of *Gazette*'s best 128 programs, including utilities, games, and applications. Titles: *MetaBASIC 128, RAMDisk 128, 80-Column Disk Sector Editor, MultiSort, Block Out, Miami Ice, The Animals' Show, Cribbage, XPressCard, Sound Designer, Video Slide Show, Math Graphics,* and *3-D BarGrapher.*

SPECIAL OFFER! **All 6 DISKS FOR ONLY $49.95!** **A $13.00 SAVINGS!**

All prices include shipping & handling.

SpeedScript	☐	$11.95
Gazette's Power Tools	☐	$ 9.95
Best Gazette Games	☐	$ 9.95
Gazette Index	☐	$ 7.95
The GEOS Collection	☐	$11.95
128 Classics	☐	$11.95
Special 6-Disk Offer	☐	$49.95

Subtotal _____
State Sales Tax* _____
Outside U.S. or Canada** _____
Total _____

Name _____
Address _____
City _____ State _____ ZIP _____
Amount enclosed $ _____
Method of payment ☐ Check or Money Order
☐ VISA or MasterCard (for orders over $20)
Credit card no. _____
Expiration date _____
Signature (required) _____
Daytime phone number _____

* Residents of New York, Pennsylvania, and North Carolina add appropriate sales tax.
** For delivery outside the U.S. or Canada, add $1 for surface mail or $3 for airmail. All orders must be in U.S. funds drawn on a U.S. bank.

feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

Inference Engine

I'm attempting to write a simple artificial-intelligence program on my 64 and have gotten as far as teaching the computer a few facts and having it answer some questions. For example, it will do the following (my input is in uppercase, the computer's response is in lowercase):

A BEAR IS A MAMMAL
understood
WHAT IS A BEAR
mammal
A MAMMAL IS AN ANIMAL
understood
WHAT IS A BEAR
mammal

To the last question, the computer should respond, *mammal* and *animal*, but I can't get it to do that. I've enclosed my program. Any ideas or suggestions?

Ron Poulton
Langley, B.C., Canada

You're using the right approach, but you don't take it far enough. You display all the information directly linked to a noun, but you fail to account for the indirect links. The example program below shows how this can be done.

```
SX 100 PRINT"{CLR}{DOWN}INFERE
       NCE ENGINE"
SA 110 PRINT"{DOWN}ENTER FACTS
        IN THIS FORM:"
HB 120 PRINT"{5 SPACES}A BEAR
       {SPACE}IS A MAMMAL"
XX 130 PRINT"{DOWN}QUESTIONS L
       IKE THIS:"
FE 140 PRINT"{5 SPACES}WHAT IS
        A BEAR"
RC 150 PRINT"{DOWN}ENTER BYE T
       O EXIT"
MG 160 DIM B$(100),FA(100,20),
       FL(100),STK(100)
RM 170 NA=4:FOR L=1 TO NA:READ
        ART$(L):NEXT:DATA A,AN
       ,IS,WHAT
XK 180 PRINT:INPUTA$:FOR L=1 T
       O H:T$(L)="":NEXT:H=1
XE 190 REM PARSE THE LIST
XP 200 FOR L=1 TO LEN(A$):J$=M
       ID$(A$,L,1)
SH 210 REM LOOK FOR SPACES
JK 220 IF J$=" " THEN H=H+1:GO
       TO240
MM 230 T$(H)=T$(H)+J$
AD 240 NEXT:IF T$(1)="EXIT" OR
        T$(1)="QUIT" OR T$(1)=
       "BYE" THEN PRINT"{CLR}"
       :END
SM 250 NN=1
ES 260 FOR I=1 TO H:F=0
SD 270 FOR L=1 TO NA
AB 280 IF ART$(L)=T$(I) THEN F
       =1
JM 290 NEXT L
MR 300 IF F=0 THEN W$(NN)=T$(I
       ):NN=NN+1
PK 310 NEXT I
JE 320 IF T$(1)="WHAT" THEN440
BK 330 IF NN<>3 THEN PRINT"MUS
       T HAVE TWO NOUNS":GOTO1
       80
RH 340 REM BUILD FACT TABLE
AG 350 N=1:GOSUB570:I1=I
JR 360 N=2:GOSUB570:I2=I:J=0
FQ 370 IF FA(I1,J)=0 THEN FA(I
       1,J)=I2:GOTO410
CQ 380 IF FA(I1,J)=I2 THEN PRI
       NT"ALREADY KNOW THAT":G
       OTO180
AR 390 J=J+1:IF J>20 THEN PRIN
       T"FA ARRAY FULL, ERROR"
RS 400 GOTO370
AJ 410 PRINT"UNDERSTOOD"
MX 420 GOTO180
GB 430 REM RESPOND TO QUESTION
       S
FP 440 IF NN>2 THEN PRINT"USE
       {SPACE}ONE NOUN IN QUES
       TIONS":GOTO180
XJ 450 N=1:GOSUB570:I1=I
JF 460 REM CLEAR STACK
BX 470 FOR I=1 TO 100:STK(I)=-
       1:FL(I)=-1:NEXT:SP=0
HX 480 REM DISPLAY FACTS
JM 490 J=0:K=I1:IF FA(K,J)=0 T
       HEN PRINT"NO KNOWLEDGE
       {SPACE}ABOUT "W$(1):GOT
       O180
EH 500 FL(K)=1:IF FA(K,J)=-1 T
       HEN540
FR 510 T=FA(K,J)
FS 520 IF FL(T)=-1 THEN FL(T)=
       1:PRINT"{2 SPACES}"B$(T
       );:SP=SP+1:STK(SP)=T
RB 530 J=J+1:IF J<=20 THEN500
AA 540 IF SP>0 THEN K=STK(SP):
       SP=SP-1:J=0:GOTO500
CQ 550 REM STACK IS EMPTY, SO
       {SPACE}WE ARE DONE
RA 560 GOTO180:REM GO FOR MORE
        INPUT
BX 570 A$=W$(N):I=1
DX 580 IF B$(I)="" THEN B$(I)=
       A$:RETURN
XA 590 IF B$(I)=A$ THEN RETURN
EB 600 I=I+1:IF I>100 THEN PRI
       NT"B$ ARRAY FULL, ERROR
       ":RETURN
RR 610 GOTO580
```

The program begins with no "knowledge"; it "learns" through the facts that you enter. Before you ask it any questions, you must enter a few facts. If, for example, you ask a question about a horse before entering any facts about horses, the program prints the message NO KNOWLEDGE ABOUT HORSE. You can enter complex facts by entering hyphens between each word (for example, A mammal is warm-blooded*). Also, there is no provision for deleting or saving facts to disk.*

The program stores facts (nouns) in B$() and the fact links in the two-dimensional array FA. Each time you ask a question, the program displays each related piece of information and then pushes it onto a stack (STK array). When the program can't find any more references to the item you asked about, it takes a related item from the stack and continues searching. All the information has been displayed when the stack is empty.

To better understand how the program works, let's look at an example. Run the program and type in the statements below.

A CAT IS A MAMMAL
A CAT IS A FELINE
A MAMMAL IS AN ANIMAL
AN ANIMAL IS NOT-A-PLANT
A FELINE IS WARM-BLOODED

As each statement is entered, the facts are stored in B$() and the relationships between the facts (fact links) are stored in FA().

When you enter the question, WHAT IS A CAT?, *the program searches the array B$() for the noun, CAT. When it finds CAT, it follows the link from CAT to MAMMAL and prints MAMMAL. It then pushes MAMMAL onto the stack and searches for CAT again. (The program actually stores the fact links—not the facts—on the stack. To simplify the discussion, we'll say that the facts are stored on the stack.) It finds CAT for a second time, follows the link to FELINE, and prints FELINE.*

FELINE is pushed onto the stack, and the program searches for CAT once more. This time it doesn't find CAT, so it pulls FELINE from the top of the stack and searches for that. It finds FELINE and follows the link to WARM-BLOODED. Next, it prints WARM-BLOODED on the screen, pushes it onto the stack, and searches for FELINE again. There aren't any more references to FELINE, so it pulls WARM-BLOODED from the stack and searches for that. It can't find WARM-

BLOODED either, so it pulls MAMMAL from the stack, searches for it, and finds it.

The program then follows the link from MAMMAL to ANIMAL, prints ANIMAL on the screen, and pushes it onto the stack. Next, it searches for MAMMAL again. Failing to find it, the program pulls ANIMAL off of the stack and searches for that. Finding ANIMAL, it follows the link to NOT-A-PLANT, prints it, and then pushes NOT-A-PLANT onto the stack. Now, the program searches for ANIMAL again. It doesn't find it, so it pulls NOT-A-PLANT from the stack, searches for it, and doesn't find it, either.

The program trys to pull another fact from the stack, but the stack is empty, so the search is complete. Here's what the output looks like:

```
MAMMAL FELINE WARM-BLOODED
  ANIMAL NOT-A-PLANT
```

Bicycle-Log Program

I'm looking for a 64 program that will log the number of miles I ride my bicycle. I am in a weight-loss program and believe that keeping a record would help me stick with it. Thanks.

Rick Duguay
Athal, MA

Here's a simple program designed to keep track of as many as 100 bicycle trips.

```
AF 10 POKE53281,0:POKE53280,11
PM 20 MX=100:DIM DT$(MX),MI(MX
      ),H%(MX),M%(MX),SS(MX),C
      M$(MX),SP(MX):HR=0:RN=0
BM 30 PRINT"{CLR}{8} BIKE LOG"
KJ 40 PRINT
BF 50 PRINT"{2 SPACES}DATE
      {2 SPACES}-MILES-
      {2 SPACES}TIME{2 SPACES}
      -SPD - COMMENTS"
FM 60 SP$=" ":L$="{LEFT}":R$="
      {RIGHT}":D$="{DOWN}"
RB 70 FORI=1 TO 6:SP$=SP$+SP$:
      L$=L$+L$:R$=R$+R$:D$=D$+
      D$:NEXT
CX 80 C2$="********+*****+****
      ****+****+**********":PR
      INTC2$
AQ 90 T=0:M2=M1+9:IF M2>HR THE
      N M2=HR
DK 100 FOR I=M1 TO M2
JD 110 PRINT"{8 SPACES}-
      {5 SPACES}-{8 SPACES}-
      {4 SPACES}-{UP}"
CF 120 T=T+1:IF T=6 THEN T=0:P
      RINTC2$;:I=I-1:GOTO240
EA 130 T$=DT$(I):L=8:P=0:IF T$
      ="" THEN240
PJ 140 GOSUB670:T$=STR$(MI(I))
      :P=9:L=5:GOSUB670
XA 150 T$="":IF H%(I)=0 THEN17
      0
CD 160 T$=STR$(H%(I))+"H"
SJ 170 IF M%(I)>=1 THEN T$=T$+
      STR$(M%(I))+"M"
SQ 180 IF H%(I)>0 THEN210
ES 190 IF SS(I)<10 THEN T$=T$+
      " "
RG 200 T$=T$+STR$(SS(I))+"S"
SC 210 P=15:L=8:GOSUB670
AH 220 T$=STR$(SP(I)):P=24:L=4
      :GOSUB670
KR 230 T$=CM$(I):P=29:L=10:GOS
      UB670
GQ 240 PRINT:NEXT
FF 250 PRINT"{2 DOWN}NEXT
      {6 SPACES}F1"
PB 260 PRINT"PREVIOUS
      {2 SPACES}F3{3 SPACES}E
      XIT{2 SPACES}F4"
KB 270 PRINT"UPDATE{4 SPACES}F
      5"
GE 280 PRINT"LOAD{6 SPACES}F7
      {3 SPACES}SAVE
      {2 SPACES}F8"
ES 290 IF RN>MX-3 THEN PRINT"
      {DOWN}WARNING, ARRAYS A
      LMOST FULL"
HB 300 GETA$:IF A$="" THEN300
HQ 310 A=ASC(A$):IF A<133 OR A
      >140 THEN300
KH 320 ON A-132 GOSUB610,630,4
      80,340,30,650,30,410
XJ 330 GOTO30
PM 340 P$="LOAD FILENAME":GOSU
      B660:F$=T$
GD 350 IF T$="" THEN RETURN
RQ 360 OPEN2,8,2,F$
HC 370 INPUT#2,R$:HR=VAL(R$):R
      N=HR+1
HB 380 FOR I=0 TO HR
JX 390 INPUT#2,DT$(I),MI(I),H%
      (I),M%(I),SS(I),SP(I),C
      M$(I)
SC 400 NEXT:CLOSE2:RETURN
XM 410 IF F$<>"" THEN PRINT"CU
      RRENT FILE:";F$
KG 420 P$="SAVE FILENAME":GOSU
      B660:IF T$="" THEN F$="
      ":RETURN
HR 430 F$=T$:OPEN1,8,1,F$:PRIN
      T#1,HR
MF 440 FOR I=0 TO HR
HX 450 PRINT#1,DT$(I)","MI(I)
AQ 460 PRINT#1,H%(I)","M%(I)",
      "SS(I)","SP(I)","CHR$(
      34)CM$(I)CHR$(34)
CQ 470 NEXT:CLOSE1:PRINT"SAVE
      {SPACE}COMPLETE":RETURN
PJ 480 PRINT"{CLR}ENTER NEW IN
      FO (BLANK DATE TO CANCE
      L)"
FC 490 P$="DATE (10/12/89)":GO
      SUB660:IF T$="" THEN RE
      TURN
XB 500 DT$(RN)=T$
MB 510 P$="MILES (IE.: 10.5)":
      GOSUB660:IF T=0 THEN510
RQ 520 MI(RN)=T
SE 530 PRINT"ENTER TIME (IN 3
      {SPACE}PARTS)"
CX 540 P$="{6 SPACES}HOURS":GO
      SUB660:H%(RN)=T
RB 550 P$="{6 SPACES}MINUTES":
      GOSUB660:M%(RN)=T
PB 560 P$="{6 SPACES}SECONDS":
      GOSUB660:SS(RN)=T
HQ 570 SP(RN)=MI(RN)/(H%(RN)+M
      %(RN)/60+SS(RN)/3600)
MM 580 P$="COMMENTS:":GOSUB660
      :CM$(RN)=LEFT$(T$,10)
SB 590 P$="IS THIS CORRECT (Y/
      N)":GOSUB660:IF T$<>"Y"
       THEN490
DJ 600 RN=RN+1:HR=RN-1:RETURN
BS 610 M1=M1+10:IF M1>HR THEN
      {SPACE}M1=HR-10:IF M1<0
       THEN M1=0
XR 620 RETURN
EH 630 M1=M1-10:IF M1<0 THEN M
      1=0
HS 640 RETURN
JQ 650 PRINT"{CLR}":END
AG 660 T$="":PRINTP$;:INPUT T$
      :T=VAL(T$):RETURN
FP 670 IF P>0 THEN PRINTLEFT$(
      R$,P);
JG 680 IF LEFT$(T$,1)=" " THEN
       T$=RIGHT$(T$,LEN(T$)-1
      )
QA 690 PRINTLEFT$(T$,L)"{UP}":
      RETURN
```

To enter data for a trip, press f5. You'll be prompted for the date of the trip, the distance you rode, the time required, and a brief comment. When you've entered this information, the program displays the average speed for the trip.

Continue this process until you've logged each trip. If there are more than ten entries, use f1 (show next ten entries) and f3 (show previous ten) to move through the data display. When you've entered the data for all your trips, press f8 to save the data to disk; to load a data file, press f7.

Notice that the program doesn't allow you to insert, delete, edit, or print the data. Adding these features would be a good project for budding programmers.

Missing Color?

I'm a beginning BASIC programmer with a Commodore 128D. I found that I can use only one color at a time in graphics mode 1 and 2, and no more than three colors at once in graphics mode 3 and 4. I thought that modes 1 and 2 offered two color choices and that modes 3 and 4 offered four. Could you please show me how to get these extra colors? Is there something wrong with my computer?

Arif Mohamed Salem
Abu Dhabi, United Arab Emirates

There is nothing wrong with your computer; you didn't include the background color in your count. In graphics mode 1, standard hi res, and in graphics mode 2, split-screen standard hi res, you control two color sources, the foreground color and the background color. In graphics mode 3, multicolor hi res, and in graphics mode 4, split-screen multicolor hi res, you control four color sources, the foreground color, multicolor 1, multicolor 2, and the background color.

To display a pixel in the background color, specify color source 0 when you plot it. The background color is the same throughout the entire bitmap; the other colors can vary for each pixel. The following two-liner illustrates this concept for graphics mode 1:

```
10 COLOR 0,5:GRAPHIC 1,1
20 COLOR 1,1:DRAW 1,0,0 TO 319,199
```

The first command in line 10 sets the background color register to purple. The second command clears the hi-res screen to the color specified in the background color register. Line 20 sets the foreground color register to black and then draws a line in this color. **G**

LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

Why Change?

My secretary has an $800 PC compatible, a $400 monitor, and a $400 printer. After she learned to use the system, she was bragging about what it did. She was shocked to learn that my inexpensive 64 system did the same thing. I familiarized her with my 64 and got her started on a database for my accounts/sales. She admitted that working with the 64 was easier than with her more expensive computer.

The point I'd like to make is this: Why switch to another system unless there's really a need to? Let's stop worrying about what's going to happen to Commodore. Let's take advantage of the existing machines and really utilize them. Let the quitters "upgrade" to a "better" system and pay heavily for it.

Dave Rich
Santa Maria, CA

Save $ with Mail Order

In "Cartridge Power" (November 1989), you state that you can purchase The Final Cartridge III for $69.95. Tenex Computer Express (P.O. Box 6578, South Bend, Indiana 46660-6578) sells it for only $49.95. I recently purchased it from them. Buyers should request information first.

Andy Orthmann
La Center, WA

When we publish prices for products in features or reviews, we always list the suggested retail price. We're very much aware that users can nearly always get a product for less through mail-order houses. Also, we noticed in a recent issue that one of our advertisers, Briwall, was selling The Final Cartridge III for $49.

Color Quest

Didn't Commodore make a color printer and a color plotter? If so, are they still available?

Robert McLain
Irwin, PA

Commodore announced a $200 plotter at the 1983 Winter Consumer Electronics Show (see last month's feature "'80s Ups & Downs"). When the plotter finally became available, Gazette *reviewed it in the August 1984 issue. Dubbed the 1520 Printer/Plotter, it hit the market with a suggested retail price of $125, and it featured four special ballpoint, colored pens. The product never sold very well and has not been available for several years. We have heard of the MPS-1500C, a fairly new Commodore color printer which is available only in Europe. Two color printers currently available for the 64 are Okidata's Okimate-20 (which requires the optional 64 Plug 'N' Print Kit) and Star Micronics' NX-1000C Rainbow, which is a Commodore-ready printer.*

Vehicle Tracks

I have four vehicles, and I've been searching for a program I can use to keep track of all my scheduled maintenance, plus all repairs and general costs of running the vehicles. None of the local software stores know of any commercial program that does this. Do you?

John T. Mahoney
Lincoln Park, NJ

No, we don't. But we suggest that you try using a spreadsheet or database to log in, organize, and store your information. A database will allow you to search for dates, names, and so on; and a spreadsheet will allow you to plug in formulas when you need to calculate costs. The beauty of using these applications is that you can set them up any way you like, tailoring them to suit the needs of your situation.

Modem Maneuvers

I just purchased a 1670 modem for my 64. It seems to me that the only thing I can do with it is to go online with QuantumLink. What else can I use my modem for?

Shon Ward
Oxon Hill, MD

You can use your modem in a couple of new ways: telecommunicate with a friend who has a modem, and call up bulletin boards to chat, browse, and upload and download programs. Also, there are a few commercial games, such as Electronic Arts' new Modem Wars, *that are designed for play by modem.*

QLink is an excellent online service, especially for Commodore users, but there are a number of other good ones as well (CompuServe, GEnie, and People/Link, for example) that you can check out. We publish some user group bulletin board numbers in our monthly "User Group Update" column, but the best comprehensive resource we have for user group bulletin boards is in our "Guide to Commodore User Groups," which appears annually in the May and June issues.

Miffed by GIF

Are there any GIF picture-viewer programs around for the 128? I've searched a lot of bulletin boards to no avail.

Robert M. Lutke
Pekin, IL

We know of GIF file viewers for the 64 and 128 on CompuServe's Graphics Support Forum. For those who don't know what we're talking about, GIF (Graphics Interchange Format) is a data-storage format designed for storing high-quality color graphics images so they can be exchanged between users with different hardware. A 128 or 64 user can, for example, view a GIF file created on a PC, an Amiga, an ST, and so on, if he or she has a GIF file viewer.

Out of Sight

I've subscribed to *Gazette* for many years and have found it to be the ultimate in information. I'm an advanced BASIC programmer, thanks to your magazine. For a while, however, I tried to follow your instructions on learning machine language, but I got lost. I understand that COMPUTE! published a book on the subject. I'd like to purchase that book. I've checked several bookstores without success.

George Salley
Willingboro, NJ

You're no doubt thinking of the book Machine Language for Beginners, *by Richard Mansfield, published by COMPUTE! Books in 1983. (COMPUTE! Books is a separate company from our magazine group.) This bestseller sold 90,000 copies before it went out of print several years ago. It's an excellent tool for learning machine language. We suggest that you contact a local user group or your local library to see if either has a copy. A few staff members here have copies that they use; if we find an extra one lying around the office, we'll send it off to you. No guarantees, however, so check out the sources mentioned above.* **G**

power BASIC

Font Magic

Shao-Tien Pan

Add enlarged or underlined characters to your programs with this short machine language utility for the 64.

Many programs have messages or instructions that require special emphasis. There are several ways to provide this; you can print the message in inverse, in several colors, in a scrolling banner, and so forth.

Font Magic gives you one more way to make your text stand out: It prints it as double-width, double-height, or underlined. And it works with both the built-in ROM sets and with custom character sets. Furthermore, since it's short, *Font Magic* can easily be added to your BASIC programs.

Getting Started

Although written in machine language (ML), *Font Magic* is listed in the form of a BASIC loader. To avoid typing errors, enter the program using *The Automatic Proofreader*, found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to tape or disk before you run it.

To get started, simply load the program and type RUN. *Font Magic* POKEs the ML into memory and then displays some sample text using each routine.

Using the Program

Font Magic contains four separate ML routines: a main subroutine at locations 49152–49357; a horizontal, or *x*-, expander at 49438–49505; a vertical, or *y*-, expander at 49358–49437; and an underliner at 49506–49545.

To use *Font Magic*, first select a source character set that you wish to alter with the following command:

```
POKE 53272,n
```

The parameter *n* can be one of four values: 20 for the uppercase/graphics ROM set, 22 for the lower-/uppercase ROM set, 28 for a custom character set at 12288, or 30 for a custom set at 14336. If you use some other value, *Font Magic* defaults to 22 (the lower-/uppercase set).

The source set will be copied by the program in an expanded or underlined form beginning at 14336. If your source set is already located at 14336 (a value of 30 is POKEd into 53272), it will be overwritten by the destination set.

After you've indicated which character set to use, SYS to the appropriate routine to create and activate the new character set. For example, to turn on the *x*-expanded set, enter SYS 49438; to activate the *y*-expanded set, enter SYS 49358; and to turn on the underlined set, type SYS 49506.

The expander routines make characters either twice as wide (the *x*-expander) or twice as tall (the *y*-expander). Each character is made up of two parts. Print a normal character to display either the left (*x*-expander) or the top half (*y*-expander) of a character; print the corresponding reverse character to display the remainder of the expanded character.

For instance, to expand the lower-/uppercase ROM set horizontally and print the letter *A* with it, enter the following:

```
POKE 53272,22:SYS 49438:PRINT"A
{RVS}A"
```

The underliner routine replaces the inverse portion of the character set with underlined characters. To allow for a visible cursor, the inverse space appears as an underlined space. If you wish to print a normal space, use SHIFT–SPACE. Lines 750–780 in the program show how to access and print underlined characters.

Font Magic

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
QE 20 POKE53280,6:POKE53281,6
DX 30 PRINT"{CLR}{WHT}"TAB(14)
      "{RVS} FONT MAGIC {OFF}"
      :PRINTTAB(13)"COPYRIGHT
      {SPACE}1990"
RX 40 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS, INC.":PRINTTA
      B(11)"ALL RIGHTS RESERVE
      D"
BS 50 REM MAIN
KR 60 FORA=49152TO49357:READAA
      :POKEA,AA:NEXT
CD 70 DATA173,24,208,41,14,168
      ,201,14
KJ 80 DATA240,124,162,0,152,20
      1,12,208
QP 90 DATA30,189,0,48,157,0,56
      ,189,0,49
AA 100 DATA157,0,57,189,0,50,1
      57,0,58,189
KG 110 DATA0,51,157,0,59,232,2
      08,229,76
AH 120 DATA129,192,169,0,141,1
      4,220,169
CG 130 DATA51,133,1,162,0,152,
      201,4,208
BR 140 DATA30,189,0,208,157,0,
      56,189,0
SA 150 DATA209,157,0,57,189,0,
      210,157,0
XQ 160 DATA58,189,0,211,157,0,
      59,232,208
DR 170 DATA229,76,120,192,189,
      0,216,157,0
DE 180 DATA56,189,0,217,157,0,
      57,189,0
AQ 190 DATA218,157,0,58,189,0,
      219,157,0
CH 200 DATA59,232,208,229,169,
      55,133,1
JM 210 DATA169,1,141,14,220,16
      9,30,141,24
KG 220 DATA208,169,248,141,199
      ,192,141
MF 230 DATA203,192,169,59,141,
      200,192,169
JD 240 DATA63,141,204,192,32,2
      25,192,173
GS 250 DATA199,192,56,233,8,14
      1,199,192
MS 260 DATA141,203,192,176,239
      ,206,200
HP 270 DATA192,206,204,192,173
      ,200,192
DE 280 DATA201,55,208,226,96,1
      69,189,141
RE 290 DATA198,192,76,198,192,
      168,169,157
FS 300 DATA141,198,192,152,189
      ,248,59,96
AS 310 DATA157,248,63,96
JX 320 REM Y-EXPANDER
DC 330 FORA=49358TO49437:READA
      A:POKEA,AA:NEXT
FQ 340 DATA169,225,141,153,192
      ,169,192
AP 350 DATA141,154,192,32,0,19
      2,169,255
RH 360 DATA141,7,61,96,169,7,1
      41,234,192
CR 370 DATA141,242,192,162,7,2
      06,234,192
SX 380 DATA32,183,192,162,7,20
      6,242,192
GE 390 DATA206,242,192,32,202,
      192,202,32
XE 400 DATA202,192,173,242,192
      ,16,228,162
BA 410 DATA3,32,183,192,168,13
      8,10,170
PS 420 DATA152,32,191,192,232,
      32,191,192
DQ 430 DATA202,138,74,170,202,
      16,234,96
RH 440 REM X-EXPANDER
AA 450 FORA=49438TO49505:READA
      A:POKEA,AA:NEXT
GG 460 DATA169,49,141,153,192,
      169,193,141
XJ 470 DATA154,192,32,0,192,16
      9,255,141,7
MK 480 DATA61,96,162,7,32,183,
```

```
      192,72,41
EG 490 DATA15,168,185,82,193,32,202,192
ED 500 DATA104,41,240,74,74,74,74,168,185
FX 510 DATA82,193,32,191,192,202,16,226
CB 520 DATA96,0,3,12,15,48,51,60,63,192
DG 530 DATA195,204,207,240,243,252,255
CS 540 REM UNDERLINER
DJ 550 FORA=49506TO49545:READAA:POKEA,AA:NEXT
BQ 560 DATA169,117,141,153,192,169,193
XK 570 DATA141,154,192,32,0,192,169,0,141
KD 580 DATA7,63,96,162,7,32,183,192,73
DD 590 DATA255,32,202,192,202,32,183,192
QR 600 DATA32,202,192,202,16,247,96
BH 610 REM ** DEMO ***
PF 620 PRINT"{CLR}"
GF 630 POKE53272,20:SYS49438:REM X EXPAND
HE 640 FORX=65TO90
JH 650 PRINTCHR$(X);
PH 660 PRINT"{RVS}";CHR$(X);"{OFF}";:NEXT
CF 670 PRINT:PRINT"{2 DOWN}X{RVS}X{OFF}
      {SPACE}E{RVS}E{OFF}X{RVS}X{OFF}P{RVS}P
      {OFF}A{RVS}A{OFF}N{RVS}N{OFF}D{RVS}D
      {OFF}"
GS 680 FORX=1TO2000:NEXT:PRINT"{CLR}"
CR 690 POKE53272,20:SYS49358:REM Y EXPAND
CK 700 FORX=65TO90
FP 710 PRINTCHR$(X);
BX 720 PRINT"{DOWN}{LEFT}{RVS}";CHR$(X);"
      {OFF}{UP}";:NEXT
AP 730 PRINT:PRINT"{3 DOWN}Y{SPACE}EXPAND":PR
      INT"{RVS}Y{SPACE}EXPAND"
KM 740 FORX=1TO2000:NEXT:PRINT"{CLR}"
KC 750 POKE53272,20:SYS49506:REM UNDERLINE
MQ 760 FORX=65TO90
SX 770 PRINT"{RVS}";CHR$(X);:NEXT
MB 780 PRINT:PRINT"{3 DOWN}{RVS}UNDERLINE
      {SPACE}TEXT"
CH 790 FORX=1TO2000:NEXT:PRINT"{CLR}"        G
```


New Release!

Version 6.0

The first in a new series of integrated C64/C128 hardware products from CMD

JiffyDOS™

Give your system a new lease on life and the power to compete with today's newer, more expensive machines

- **Ultra-fast multi-line serial technology.** Enables JiffyDOS to outperform Cartridges, Burst ROMs, Turbo ROMs, and Parallel Systems – without any of the disadvantages.
- **Speeds up all disk operations.** Load, Save, Format, Scratch, Validate, access PRG, SEQ, REL, USR & direct-access files up to **15 times faster!**
- **100% Compatible – or your money back.** Guaranteed to work with all your hardware and software, including copy-protected commercial programs.
- **Uses no ports, memory or extra cabling.** The JiffyDOS ROMs upgrade your computer and drive(s) internally for maximum speed and compatibility.
- **Easy Installation.** No electronics experience or special tools required.
- **Supports C64, 64C, SX64, C128, C128D, 1541, 1541C, 1541-II, 1571, 1581 and more**
- **Can be completely switched out.** If ever necessary, the flip of a switch returns you to a 100% stock configuration – without resetting or powering down.
- **Built-in DOS Wedge.** Plus 17 additional commands and convenience features, including file copier, screen dump, directory menu, and single-key load/save/scratch.

C-64/SX-64 systems $59.95; C-128/C-128D systems $69.95; Add'l drive ROMs $29.95
Please specify computer (with serial number) and drive(s) when ordering

System includes ROMs for computer and one drive, User's Manual, illustrated step-by-step installation instructions, 30-day money-back compatibility guarantee and 90-day parts warranty. Add $4.25 shipping/handling per order, plus $3.00 for C.O.D., APO, FPO, AK, HI, PR & Canada. $10.00 add'l for other overseas orders. MA residents add 5% sales tax. VISA/MC, COD, Check, Money Order. Allow 2 weeks for personal checks. U.G. & Dealer pricing available. Call or write for more information.

• Version 5.0 owners call for upgrade information and prices •

FACTORY AUTHORIZED

COMMODORE REPAIR CENTER

1-800-772-7289

(312) 879-2888 IN ILLINOIS

C64 Repair (PCB ONLY)	42.95	C128D Repair	CALL
C-128 Repair (PCB ONLY)	64.95	Amiga Repair	CALL
1541 Permanent Alignment	29.95	Printers	CALL
1541 Repair	79.95	Monitors	CALL
1571 Repair	79.95	Other Equipment	CALL

CALL BEFORE SHIPPING FOR AUTHORIZATION NUMBER
(Have Serial and Card Numbers ready)
PARTS AND LABOR INCLUDED
FREE RETURN SHIPPING
(APO, FPO, AIR ADD $10.00)
24-48 HR. TURNAROUND
(Subject to Parts Availability)
30 DAY WARRANTY ON ALL REPAIRS

COMMODORE PARTS

CALL (312) 879-2350

C-64 Power Supply	34.95*
C128 Power Supply	59.95*
Other Parts	CALL

*(Plus $3.00 Shipping/Handling)

TEKTONICS PLUS, INC.

150 HOUSTON STREET
BATAVIA, IL 60510

VISA MasterCard

JiffyDOS™ Version 6.0

New Features and Enhancements

- **Built-in two drive file copier.** Copy PRG, SEQ, REL and USR files between two drives of any type or to and from REU's. Great for quick backups and moving programs and files between 1541, 1571 & 1581 drives. Directory menu, two-key commands, and Control-key combinations enable easy selection of source and destination drives and the files you want to copy. Can also be used to change filetypes.
- **REU support.** The JiffyDOS commands now fully support Commodore RAM Expansion Units running under RAMDOS. Access your REU just like a disk drive without having to load special wedge utilities.
- **1581 support.** Copy programs and files from 1541 and 1571 drives to any partition on your 1581. Move between partitions easily with just a few keystrokes.
- **Supports CMD HD Series Hard Drives and RAMLink.** Enhances the performance of CMD's new line of integrated C64/C128 products.
- **Quick printer output toggle.** A simple 3-key command switches output from screen to printer and back with ease. Eliminates the bother of having to type the complicated OPEN4,4:CMD4 and PRINT#4:CLOSE4 command sequences.
- **Redefinable 64-mode function keys.** If the JiffyDOS function keys are not to your liking, you can easily redefine them to suit your specific needs.
- **Enhanced screen dump.** Automatic screen mode recognition and printing of uppercase/graphics & lowercase characters.
- **Adjustable sector interleave.** Enables you to increase disk-access performance even with hard-to-speedup software.

CMD **Creative Micro Designs, Inc.**
50 Industrial Drive, PO Box 646 Phone: 413-525-0023
East Longmeadow, MA 01028 FAX: 413-525-0147

Circle Reader Service Number 196

Join SD of A's Sale-A-Brate A

We have what

On a Budget?

See Our Under $10 Bargain Basement.

ACCOLADE
Ace of Aces $9.88
Apollo 18 ..... $9.88
Bubble Ghost $9.88
4th & Inches Football .. $9.88
4th & Inches Team Const. $6.88
Hardball $9.88
Test Drive 1 ..... $9.88

ACTIVISION
Aliens $9.88
Apache Strike $9.88
Ghostbusters $9.88
Hacker 1 or 2 ..... $9.88 Ea.
Last Ninja #1 ..... $9.88
Ocean Ranger $9.88
Predator $9.88
Shanghai $9.88
Transformers $9.88

ADVANTAGE
Deceptor $9.88
Desert Fox $9.88
Frightmare $9.88
Harrier 7 ..... $9.88
Mental Blocks $9.88
Shoot'em Up Const. Set $9.88
Spy vs. Spy 1 & 2 ..... $9.88

AEC FUN LEARNING
Life Science $5.88
U.S. Geography $5.88
U.S. Government $5.88
U.S. History 1 or 2 ..... $5.88 Ea.
Vocabulary Builder $5.88

BOX OFFICE
Alf $9.88
High Rollers & $100,000 Pyramid $9.88

BRODERBUND
Arcade Game Const. Kit $9.88
Choplifter/Davids Midnight Magic $6.88
Karateka $6.88
Loderunner $6.88
Magnetron $9.88
Superbike Challenge .. $6.88

CDA
Amer. Cooks French ... $9.88

CINEMAWARE CLASSICS
Sinbad $9.88

COSMI
Swift Data Base $6.88
Swift Desktop Publisher $6.88
Swift Music $6.88
Swift Paint $6.88
Swift Spreadsheet $6.88
Swift Word Processor .. $6.88

DATA EAST
Ikari Warrior $9.88
Platoon $9.88

EASY WORKING/ SPINNAKER
Filer $6.88
Planner $6.88
Writer $6.88

ELECTRONIC ARTS
Adv. Const. Set $9.88
Amer. Cup Sailing $7.88
Artic Fox $9.88
Deathlord $9.88
Demon Stalkers $9.88
Financial Cookbook ... $7.88
Heart of Africa $7.88
Instant Music $9.88
Legacy of Ancients $9.88
Lords of Conquest $9.88
Marble Madness $9.88
Mars Saga $9.88
Modem Wars $9.88
Music Const. Set $9.88
Pegasus $9.88
Pinball Const. Set $9.88
Powerplay Hockey $9.88
Realm of Impossibility ... $7.88
Skyfox $9.88
Skyfox 2 ..... $9.88
Skate or Die $9.88
Strike Fleet $9.88
Super Boulder Dash ... $9.88
Touchdown Football ... $9.88
Wasteland $9.88
World Tour Golf $9.88

EPYX
4×4 Off Road Racing .. $9.88
Dive Bomber $9.88
Space Station Oblivion ... $9.88
Sub Battle Simulator ... $9.88
Tower Toppler $9.88
Winter Games $9.88

FREE SPIRIT
Galactic Frontier $9.88

GAMESTAR
Champ. Baseball $9.88
Champ. Basketball $9.88
GFL Ch. Football $9.88
On Court Tennis $9.88
Star League Baseball/ On Field Football $9.88
Take Down $9.88

GAMETEK
Candy Land $9.88
Chutes & Ladders $9.88
Double Dare $9.88
Go To Head of Class .. $9.88
Hollywood Squares $9.88
Press Your Luck $9.88
Price is Right ..... Call
Super Password $9.88

HI-TECH EXPRESSIONS
Fun House $8.88
Looney Tunes Print Kit... $9.88
Muppet Adventure $9.88
Print Power $9.88
Remote Control $8.88
Win, Lose or Draw $8.88
Win, Lose or Draw 2 .. $8.88
Win, Lose or Draw Jr.... $8.88

HI-TECH EXPRESSIONS
Sesame Street Series:
Astro Grover $6.88
Big Bird's Special Delivery $6.88
Ernie's Big Splash $6.88
Ernie's Magic Shapes.. $6.88
Grover's Animal Adv.. $6.88
Pals Around Town .. $6.88
Sesame St. Print Kit.. $9.88

INFOCOM
Hitchhikers Guide $9.88
Leather Goddesses $9.88
Zork 1 ..... $9.88

INTRACORP
Business Card Maker .. $9.88

KONAMI/ULTRA
Hyper Sports/Ping Pong $9.88

MASTERTRONIC
Last V-8 ..... $4.88
Ninja $4.88
Slam Dunk $6.88
Vegas Poker & Jackpot.. $4.88

MINDSCAPE
Mastertype (Cart) $9.88

SHARE DATA
All New Family Feud... $8.88
Concentration $9.88
Concentration 2 ..... $9.88
Jeopardy $8.88
Jeopardy Jr. $9.88
Jeopardy 2 ..... $9.88
Sports Jeopardy $9.88
Wheel of Fortune $8.88
Wheel of Fortune 2 .... $9.88
Wheel of Fortune 3 .... $9.88
Wipe Out $9.88

SIERRA
Wiz Type $6.88

SPECTRUM HOLOBYTE
Gato $9.88

SPINNAKER
Cosmic Combat $4.88
Dark Tower $4.88
Karate Chop $6.88
Learn the Alphabet $4.88
Learn to Spell $4.88
Learn to Add $4.88

SPRINGBOARD
Certificate Maker $9.88
C.M. Library Vol. 1 .... $9.88
Newsroom $9.88
N.R. Art #1, 2, or 3....$9.88 Ea.

TAITO
Alcon $9.88
Arkanoid $9.88
Bubble Bobble $9.88
Renegade $9.88

THUNDER MOUNTAIN
Doc the Destroyer $6.88
Felony $9.88
Galaxian $8.88
Rambo: First Blood Part II $6.88
Super Pac Man $9.88

VALUE WARE
Artist $4.88
Educator $4.88
Entertainer $4.88
Home Banker $4.88

ACCOLADE
Blue Angels Flight Sim .. $19
Bubble Ghost $19
Cycles ..... Call
Fast Break $19
Grand Prix Circuit $19
Heat Wave Boat Racing .. $19
Jack Nicklaus Golf $19
J.N. Glf. Chmp. Courses $9.88
J.N. Glf. Int'l Courses .. $9.88
Mini Putt $19
Rack 'Em $19
Serve & Volley $19
Steel Thunder $19
Test Drive 2: The Duel ... $19
T.D. 2: Europe Scenery . $9.88
T.D. 2: Muscle Cars ... $9.88
T.D. 2: Calif. Scenery .. $9.88
T.D. 2: Super Cars $9.88
T.K.O. $19

ACTIVISION
Battlechess $25
Beyond Dark Castle $19
*Geo-Chart $19
*Geo-Calc $33
*Geo-File $33
*Geo-Programmer $44
*Geo-Publish $33
*Requires Geos 64!

BLUE LION
Ticket to Hollywood $19
Ticket to London $19
Ticket to Paris $19
Ticket to Spain $19
Ticket to Wash. D.C. $23

BRITANNICA
Eye of Horus $25

BRODERBUND
Bank St. Writer $33
Carmen S.D. - Europe $25
Carmen S.D. - U.S.A. $25
Carmen S.D. - World $23
Downhill Challenge $14
License to Kill $14
Omni-Play Basketball $23
Print Shop $26

ULTRA

From the Saturday morning cartoons come the heroes in a half shell. Grab your nunchukus & hit the villainous streets or you'll get turned into turtle soup.

TEENAGE MUTANT NINJA TURTLES
List $29.95
SDA Discount Price $19

Crossbow $19
Dragon Wars $29
F14 Tomcat $25
F18 Hornet $23
Grave Yardage ..... Call
Last Ninja 2 ..... $23
Neuromancer $25
Rampage $23

AMERICAN EDUCATIONAL
Biology $12
Learn to Read (Gr. 1-4) .. $25
Science: Grades 3/4 .... $12
Science: Grades 5/6 .... $12
Science: Grades 7/8 .... $12
US Geography $12
US History $12
World Geography $12
World History $12

ARTWORX
Bridge 5.0 ..... $19
Cycle Knight $14
Daily Double Horse Race $14
Kaleidokubes $14
Linkword Languages .. $16 Ea.
S. P. Data Male #2 ..... $14
S. P. Data Female #1 or 3.. $14
Strip Poker $21
Tank Attack $19

AVALON HILL
NBA Basketball $25
Super Sunday $21
SBS Gen. Mgr. Disk $19
SBS 1987 Team Disk $14

BATTERIES INCLUDED
Paperclip Publisher $33
Paperclip 3 ..... $33

BAUDVILLE
Award Maker Plus $25
Blazing Paddles $23
Video Vegas $19

BERKLEY SOFTWORKS
Geos 128 2.0 ..... $44
Geo-Calc 128 ..... $44
Geo-File 128 ..... $44
Geos 64 (2.0) $39
*Desk Pack Plus $19
*Font Pak Plus $19
P.S. Companion $23
P.S. Graphics Library #1, 2 or 3 ..... $16 Ea.
P.S. Graphics Library Holiday Edition $16
Slim City $19
Star Wars $19

CAPCOM
Bionic Commando $19
Ghosts & Gobblins $19
Gunsmoke $19
Street Fighter $19

CENTRAL POINT
Copy 2 ..... $25

CINEMAWARE
Defender of the Crown ... $23
Rocket Ranger $23
The Three Stooges $23
T.V. Sports Football $19
Warp Speed (Cart) $33

CMS
General Acct. 64 or 128 ..... $119 Ea.
Inventory 128 ..... $49

COSMI
Chomp! $16
Home Office $25
Navy Seal $19
Presumed Guilty! $16
Super Huey 2 ..... $14

DATA EAST
ABC Monday Nite Football $25
Bad Dudes $19
Batman $16
Breakthru $19
Commando $14
Guerilla War $19
Heavy Barrel $19
RoboCop $23
Speed Buggy $19
Super Hang-on $19
Tag Team Wrestling $14
Victory Road $19
Vigilante $16

DATA SOFT
Alternate Reality: The City $19
The Dungeon $19

!!! SDA CLOSEOUTS !!!

Pro Golf $4.44
E.A. Amer. Cup Sailing... $6.66
Doc the Destroyer $6.66
Super Zaxxon $4.44
Worlds Greatest Baseball. $6.66
Guild of Thieves $11.11
Heart of Africa $3.33
Boston Computer Diet... $8.88
Gulf Strike $8.88
Lip Stik & Joystick ... $11.11
Typing Tutor 3 ..... $8.88
Eagles - SSI $9.99
EPYX Basic Tool Kit ... $6.66
Great Chefs Recipes ... $8.88
Jet Boys $6.66
Macbeth $9.99
Busi-Calc 3 Spreadsheet $7.77
Phantom of the Asteroids $2.22
Enlightenment $8.88
Home Inventory $4.44
Financial Cookbook ... $6.66
Master of Magic $3.33
Blowup Graphics $11.11
Alien Destination Set .. $7.77
Sea Speller $2.22
CBS Argos Expedition... $3.33
Shogun - Mastertronic .. $4.44
Deep Space $8.88
CBS Timebound $3.33

* Quantities Limited

ABACUS BOOKS
Anatomy of the 1541 ..... $14
Anatomy of the C64 ..... $14
GEOS Inside & Out $13
GEOS Tricks & Tips $13

ABACUS SOFTWARE
Assembler Monitor $25
Basic $25
Basic 128 ..... $39
*Becker Basic $33
Cad Pak $25
Cad Pack 128 ..... $39
Cad Pack 64 or 128 ..... $25 Ea.
Cobol 64 or 128 ..... $25 Ea.
Fortran $25
PPM $25
PPM 128 ..... $39
Speed Term 64 or 128 ... $25
Super C64 or 128 ... $39 Ea.
Super Pascal 64 or 128 ..... $39 Ea.
TAS 128 ..... $39
*Requires GEOS!

ACCESS
Echelon w/Lip Stik $29
Heavy Metal $25
Mean Streets $25
Tenth Frame $25
Triple Pack: BH1, BH2, Raid Over Moscow ... $14
World Class L. B. Golf ... $25
World Class L. B. Golf Fam. Course 1, 2 or 3 ... $14 Ea.

*Please Read The Following Ordering Terms & Conditions Carefully Before Placing Your Order: Orders with cashiers check or money order shipped immediately on in-stock items! Personal & Company checks, allow 3 weeks clearance. No C.O.D.'s! Shipping: Continental U.S.A.-Orders under $100 add $3; free shipping on orders over $100. AK, HI, FPO, APO-add $5 on all orders. Canada & Puerto Rico add $7.50 on all orders. Sorry, no other international orders accepted! PA residents add 6% sales tax on the total amount of order including shipping charges. CUSTOMER SERVICE HOURS: Mon.-Fri. 9 AM-5:30 PM Eastern Time. REASONS FOR CALLING CUSTOMER SERVICE—412-361-5291 (1) Status of order or back order (2) if any merchandise purchased within 60 days from SD of A is defective, please call for a return authorization number. We will not process a return without a return auth. #! Defective merchandise will be replaced with the same merchandise only. Other returns subject to a 20% restocking charge! After 60 days from your purchase date, please refer to the warranty included with the product purchased & return directly to the manufacturer. Customer service will not accept collect calls or calls on SD of A's. 800 # order lines! Prices & availability are subject to change! New titles are arriving daily! Please call for more information.

New Year's Save Party... New Decade of Deep Discounts!

you're looking for!

ACCOLADE

Capture the thrill of riding on the edge. Grueling, realistic motorcycle racing on 15 Int'l Grand Prix courses. 5 skill levels.

CYCLES

Call For Price & Availability

- Bismarck $19
- Firezone $19
- Global Commander $19
- Hunt for Red October $26
- Lancelot $21
- Rubicon Alliance $14
- Time & Magik $21

DAVIDSON
- Algeblaster $19
- Math Blaster $19
- Spell It $19
- Word Attack $19

DESIGNWARE
- Body Transparent $19
- Designasaurus $19

DIGITAL SOLUTIONS
- Pocket Filer 2 ..... $23
- Pocket Planner 2 ..... $23
- Pocket Writer 2 ..... $33
- All 3 in 1 Super Pak $59

DIGITEK
- Hole in One Min. Golf $19
- Hollywood Poker $19
- Western Games $19

ELECTRONIC ARTS
- Bard's Tale 2 or 3 ... $26 Ea.
- Bard's Hints 1, 2 or 3 ... $9 Ea.
- Beyond the Black Hole $26
- Caveman Ugh-Lympics $21
- Chessmaster 2100 ..... $26
- Chuck Yeagers AFT $23
- Demon Stalker $21
- Double Dragon $23
- Dragon's Lair $19
- Empire $26
- Ferrari Formula One ..... Call
- Fire King $21
- Indiana Jones Last Crusade Arcade Version $21
- Jordan vs. Bird $21
- Kings Beach Volleyball $21
- Madden Football ..... Call
- Magic Candle $26
- Maniac Mansion $23
- Might & Magic 1 or 2 ..... $25 Ea.
- Pipe Dream $19
- Power Play Hockey $19
- Project Firestart $21
- Starflight ..... Call
- Star Fleet 1 ..... $26
- The Mars Saga $23
- Zak McKracken $23

EPYX
- California Games $19.88
- Death Sword $14.88
- Devon Aire $19.88
- Metrocross $12.88
- Mind-Roll $14.88
- Revenge of Defender $19
- Snow Strike $14.88
- Technocop $19.88
- Tower Toppler $19.88

GAMESTAR
- Face Off Hockey $19

HI-TECH EXPRESSIONS
- Win, Lose or Draw Deluxe $16

INFOCOM
- Battletech $25
- Zork Triology $16

INKWELL SYSTEMS
- #170C Deluxe L.P. $69
- #184C Light Pen $44
- Flexidraw 5.5 ..... $23
- Graphics Galleria #1 ..... $19
- Graphics Galleria #2 ..... $19
- Graphics Integrator 2 ..... $19

INTRACORP
- Bumper Sticker Maker $33
- Button & Badge Maker $33
- Search For The Titanic $19
- Security Alert $19
- Ultimate Casino Gambling $23

KONAMI
- Teenage Mutant Ninja Turtles $19
- Pirates $25
- Project Stealth Fighter $29
- Red Storm Rising $25
- Silent Service $14

MINDSCAPE
- 720 Skateboarding $23
- Action Fighter $19
- After Burner $23
- Alien Syndrome $23
- Aussie Games $19
- Blockbuster $19
- Captain Blood $23
- Clubhouse Sports $19
- Combat Course $19
- Crossword Magic $19
- De Ja Vu $23
- Gauntlet $23
- Gauntlet 2 ..... $19
- Harrier Combat Sim $19
- Hostage $19
- Indi Jones Temple Doom $23
- Indoor Sports $19
- Int'l. Team Sports $19
- Out Run $23
- Paperboy $23
- Road Runner $23
- Sgt. Slaughters Mat Wars $19
- Shinobi $19
- Super Star Ice Hockey $19
- Super Star Hockey $23
- Super Star Soccer $23
- Thunder Blade $23
- Uninvited $23
- Willow $19

MISC UTILITIES
- Bob's Term Pro $29
- Bob's Term Pro 128 ..... $39
- Doodle $25
- Final Cartridge 3 ..... $47
- Font Master 128 ..... $29
- Maverick Utilities V.3 ..... $23
- Superbase 64 ..... $25
- Superbase 128 ..... $33
- Superscript 64 ..... $23
- Superscript 128 ..... $25
- Super Snapshot (V.4) $47

ORIGIN
- Autoduel $25
- Knights of Legend $33
- Moebius $25
- Omega $33
- Quest For Clues Book 2 ..... $19
- Space Rogue $32
- Tangled Tales $19
- Times of Lore $25
- Ultima 4 or 5 ..... $39 Ea.
- Ultima 5 Hint Book $9
- Ultima Trilogy $39
- Windwalker $25

POLARWARE
- All Dogs go to Heaven ... $19

PROFESSIONAL
- Fleet System 2 Plus $33
- Fleet System 4 128 ..... $43

PSYGNOSIS
- Baal $19
- Ballistix $19
- Blood Money $19
- Captain Fizz $19
- Menace $16

SHARE DATA
- Nightmare on Elm Street $19

SIMON & SCHUSTER
- Star Trek: Rebel $23
- Typing Tutor 4 ..... $25

SIR TECH
- Knight of Diamonds $25
- Legacy of Llylgamyn $25
- Proving Ground $25
- Wizardry Trilogy $25

SPECTRUM HOLOBYTE
- Tetris $16

SPOTLIGHT
- Darkside $21

THUNDER MOUNTAIN

Wow! 10 great games for one low price! Mutants Fist • Tau Ceti • Uridium Tai Pan • Cyrus Chess Army Moves • Demolition Mission • Doc Destroyer Bad St. Brawler ACTION PACK VOL. 2

SDA Discount Price $14

Broderbund

James Bond is out on his own & out for revenge. Show no mercy as you battle a powerful drug czar on land, sea & air.

LICENSE TO KILL
List $19.95

SDA Discount Price $19

- Death Bringer $21
- Speedball $21
- Total Eclipse $21

SSI
- *Hintbooks Available ..... Call
- Battles of Napoleon $32
- Curse of Azure Bonds $26
- D. M Mast. Asst. 1 or 2 ..... $21 Ea.
- Demon's Winter $21
- Eternal Dagger $26
- First Over Germany $32
- Gettysburg $39
- Hillstar $26
- Heroes of the Lance $21
- Overrun $32
- Pool of Radiance $26
- Storm Across Europe $39
- Typhoon of Steel $32
- War Game Const. Set $21
- War of the Lance ..... Call

SPINNAKER
- EZ Working Tri-Pack $14
- Turbo Load & Save $16

SUBLOGIC
- Flight Simulator 2 ..... $32
- F.S. Scenery Disks ..... Call
- Hawaii Scenery $19
- Jet $26
- Stealth Mission $32
- Thunder Chopper $19
- Up Periscope $19

TAITO
- Arkanoid 2: Revenge $19
- Operation Wolf $19
- Qix $19
- Rambo 3 ..... $19
- Rastan $19
- Sky Shark $19

THREE SIXTY
- Dark Castle $23
- Thud Ridge $23
- Warlock $19

TIMEWORKS
- Data Manager 2 ..... $14
- Evelyn Wood Reader $14
- Swiftax $33
- Swiftcalc/Sideways $14
- Word Writer 4 ..... $25

UNICORN
- Decimal Dungeon $19
- Percentage Panic $19
- Ten Little Robots $19

UNISON WORLD
- P.M. Art Gallery 1 + 2 ..... $19
- P.M. Art Gallery: Fantasy $16
- Print Master Plus $23

VIRGIN GAMES
- Double Dragon 2 ..... Call

WEEKLY READER
- Stickybear Series:
  - ABC's $23
  - Math 1 or 2 ..... $23 Ea.
  - Numbers $23
  - Opposites $23
  - Reading $23
  - Spellgrabber $29
  - Typing $29

ACCESSORIES
- Animation Station $49
- CompuServe Starter Kit $19
- Bonus 5¼ DSDD ... $4.99 Bx.
- Freedom Cordless Joystick $44
- Sony 5¼ DSDD ... $6.99 Bx.
- Disk Case (Holds 75) ... $6.88
- Disk Drive Cleaner ... $6.88
- 1 Controller $14
- Winner M3 Analogue Mouse $33
- EPYX 500 XJ Joystick $14
- Wico Bat Handle Joystick $17
- Wico Boss Joystick $12
- Wico Ergostick Joystick $16
- XETEC Super Graphix $59
- XETEC Super Graphix Jr. $39
- XETEC Super Graphix Gd. $79

HI TECH EXPRESSIONS

Design & print signs, banners, cards, stationery & more featuring Bugs Bunny, Daffy Duck, Sylvester, Yosemite Sam, Elmer Fud & more!

LOONEY TUNES PRINT KIT
List $14.95

SDA Discount Price $9.88

Blue Lion

Have you ever wanted to visit the White House? Explore Capital Hill? Come face to face with a giant panda? Now you can!

TICKET TO WASH. D.C.
List $34.95

SDA Discount Price $23

Speedy Delivery
Deep Discounts
Astronomical Selections

If you can't find what you're looking for in our ad, call us.

Ask your Salesperson what's on sale this month!

USA/CANADA orders
1-800-225-7638
PA Orders 1-800-223-7784
Customer Service (412) 361-5291
Fax Order Line (412) 361-4545

- Free shipping on orders over $100 in continental USA.
- No surcharge for VISA/MasterCard.
- Your card is not charged until we ship.
- School purchase orders accepted.

Send check or money orders to:
P.O. 111327-Dept. CG
Blawnox, PA 15238

Software Discounters Of America

Order Line Hours: Mon.-Thurs. 9:00 AM-9:00 PM, Fri. 9:00 AM-7:00 PM, Sat. 10:00 AM-4:00 PM Eastern Time

MODEM OWNERS: You can order on-line from our Commodore Shop via the CompuServe, GEnie and Q-Link electronics malls.

Circle Reader Service Number 124

THE geos column

DirQuick

John P. Young

Examine disks and delete files without leaving your current application with this desk accessory for GEOS and GEOS 128, versions 1.3 and higher.

The deskTop is great for managing disks and swapping applications, but it also has its limitations. For instance, suppose you want to search through your disk collection for the latest version of a program. Using the deskTop, this process is infinitely slow.

Now with *DirQuick*, this task—and others like it—can be accomplished quickly and easily. This program lets you examine the files on any drive, including RAM Expansion Units (REUs), and it even gives you information about the disk itself. But best of all, you don't have to leave the current application to use it.

Typing It In

DQGen is a machine language program that creates the *DirQuick* desk accessory on your GEOS disk. Use *MLX*, the machine language entry program listed elsewhere in this issue, to enter it. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: 0801
Ending address: 1678

Be sure to save a copy of the program to a GEOS work disk before leaving *MLX*.

To create a copy of *DirQuick*, boot GEOS and open DQGen from the deskTop. (You open a file by double-clicking on its icon or by clicking on its icon and then selecting Open from the file menu. See your GEOS manual for more information.) DQGen displays a dialog box containing the message *DirQuick will be written to the disk in DQGEN's drive.* Place the disk to contain *DirQuick* in the drive containing DQGen and click on OK. If *DirQuick* is written to the disk successfully, the program returns you to the deskTop. If there's a problem, it redisplays the dialog box. You can click on the Cancel button to return to the deskTop at any time.

Getting Started

DirQuick is a GEOS desk accessory, so you can run it by double-clicking on its icon or selecting its name from the geos menu. When you first run *DirQuick*, you'll see a dialog box containing the names of the files on the current disk. In addition, the dialog box contains four gadgets: up arrow, down arrow, question mark, and Exit. Selecting the up- and down-arrow gadgets allows you to scroll through the filenames. You can also use the up- and down-cursor keys. If you click on the question-mark gadget or type *?*, *DirQuick* prints more information about the disk or a file. Selecting the Exit gadget returns you to the deskTop.

To display information about the current disk, click on the question-mark gadget. *DirQuick* shows the name of the disk, the disk type, the free space on the disk, and the number of files on the disk. If you select a file before clicking on the question-mark gadget, *DirQuick* shows information about the file. To select a file, click on its name with the mouse. The file is deselected when you click on its filename again or select another file.

You can delete a file with *DirQuick* by selecting the file and typing X. The program asks you to confirm that you wish to delete the file. Press Y to delete the file or N to abort. *DirQuick* won't delete its swap file or its buffer, but you can delete any other file on the disk. Be careful not to delete the application that you were using prior to entering *DirQuick* or a data file that may have been used by the application. Deleting these files will cause the system to crash when you exit *DirQuick*. If you're using GEOS 2.0, you can recover a file deleted by *DirQuick* with the undo-delete option under the file menu.

To change disks with *DirQuick*, press D; to change drives, press SHIFT-D. If you're running *DirQuick* from an REU, you can access all the drives visible to GEOS. If you're not using an REU, *DirQuick* can only access drives of the same type as the one containing *DirQuick*.

DQGen

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 AD 1E 85 8D 30
0811:AD 08 20 71 C2 20 53 C2 15
0819:20 88 40 00 08 01 A9 16 11
0821:85 05 A9 79 85 04 A9 0B 9C
0829:85 03 A9 A8 85 02 20 78 69
0831:C1 A9 08 85 03 A9 AE 85 87
0839:02 20 56 C2 A5 02 C9 02 14
0841:F0 61 20 8D C1 20 4B C1 E5
0849:20 A1 C2 8A D0 E3 20 A8 D1
0851:C1 05 00 01 FF 00 7F 03 95
0859:40 00 20 07 FF 00 7F 06 03
0861:46 00 30 18 43 72 65 61 2C
0869:74 69 6E 67 20 44 69 72 A9
0871:51 75 69 63 6B 20 64 65 F4
0879:73 6B 20 61 63 63 65 73 1F
0881:73 6F 72 79 21 00 A9 08 71
0889:85 03 A9 F3 85 02 20 38 3E
0891:C2 A9 00 85 16 A9 08 85 B2
0899:15 A9 FC 85 14 20 ED C1 55
08A1:8A D0 8E AD AD 08 8D 1E 9E
08A9:85 4C 2C C2 00 81 0B 10 6D
08B1:10 C0 08 0B 10 20 DD 08 70
08B9:01 01 48 02 11 48 00 18 75
08C1:44 69 72 51 75 69 63 6B 35
08C9:20 77 69 6C 6C 20 62 65 C9
08D1:20 77 72 69 74 74 65 6E 63
08D9:20 74 6F 00 64 69 73 6B 20
08E1:20 69 6E 20 44 51 47 45 67
08E9:4E 27 73 20 64 72 69 76 91
08F1:65 00 44 69 72 51 75 69 01
08F9:63 6B 00 F3 08 03 15 BF 0C
0901:7F FF FE C0 00 03 80 08 D3
0909:01 80 08 81 80 1F 01 9F F6
0911:2F 01 80 4A 01 80 C8 01 4C
0919:B8 CF 01 80 DB 01 80 EB 73
0921:01 9C CB 01 80 0B 01 80 17
0929:4B 01 80 EB 01 B9 FE 01 DD
0931:81 3C 01 80 08 01 80 08 88
0939:01 C0 00 03 7F FF FE 83 A9
0941:05 00 FC 09 20 22 FC 09 92
0949:44 69 72 51 75 69 63 6B BE
0951:20 20 20 20 56 31 2E 31 86
0959:00 00 00 00 4A 6F 68 6E BA
0961:20 50 2E 20 59 6F 75 6E 41
0969:67 20 20 20 20 20 00 00 BE
0971:00 00 00 00 00 00 00 00 83
0979:00 00 00 00 00 00 00 00 8B
0981:00 00 00 00 00 00 00 00 93
0989:00 00 00 00 00 00 00 00 9B
0991:00 00 00 00 00 00 00 00 A3
0999:00 00 00 00 00 00 00 00 AB
09A1:00 00 00 00 00 00 00 00 B3
09A9:00 00 00 00 00 00 00 00 BB
09B1:00 00 00 00 00 00 00 00 C3
09B9:00 00 00 00 00 00 00 00 CB
09C1:00 00 00 00 00 00 00 00 D3
09C9:00 00 00 00 00 00 00 00 DB
09D1:00 00 00 00 00 00 00 00 E3
09D9:00 00 00 00 00 00 00 00 EB
09E1:00 00 00 00 00 00 00 00 F3
09E9:00 00 00 00 00 00 00 00 FB
09F1:00 00 00 00 00 00 00 00 04
09F9:00 00 00 A5 16 8D 79 16 56
0A01:2C 79 16 10 20 A9 16 85 A6
0A09:15 A9 16 85 14 A9 00 85 F9
0A11:16 20 ED C1 8A F0 0E A9 EF
0A19:16 85 03 A9 0B 85 02 20 27
0A21:38 C2 4C 3E C2 20 B7 C1 37
0A29:F0 8C 88 16 08 02 20 C5 99
0A31:13 A9 00 85 FC A9 14 85 CD
0A39:FB A9 8C 85 FE A9 FA 85 B9
0A41:FD A2 0D AD 1E 85 85 06 91
0A49:A5 FC 85 03 A5 FB 85 02 7A
0A51:A5 FE 85 05 A5 FD 85 04 2D
0A59:20 7B C1 CA F0 0E 18 A9 DA
0A61:28 65 FD 85 FD 90 02 E6 18
0A69:FE B8 50 D7 20 F8 12 A9 65
0A71:80 85 2F 20 A8 C1 05 00 65
0A79:01 50 00 30 03 EF 00 97 94
0A81:07 50 00 30 01 51 00 31 AE
0A89:07 EE 00 96 01 57 00 37 E2
0A91:07 E8 00 7F 06 9F 00 8E 98
```

```
0A99:18 44 69 72 51 75 69 63 B5
0AA1:6B 00 A9 14 85 03 A9 71 DE
0AA9:85 02 20 5A C1 20 46 0B D0
0AB1:A9 13 8D A4 84 A9 EF 8D 93
0AB9:A3 84 A9 0B 8D AA 84 A9 70
0AC1:FB 8D A9 84 20 C9 0A 60 51
0AC9:A9 00 8D 7B 16 20 A1 C2 53
0AD1:8A D0 38 20 8D C1 AC 89 BE
0AD9:84 B9 86 84 29 0F C9 03 D3
0AE1:D0 03 4C BA 0B A9 01 8D E2
0AE9:7E 16 A9 12 85 04 A9 01 A9
0AF1:85 05 20 0F 0B D0 FB AD 40
0AF9:8B 84 F0 0F AD AB 82 F0 16
0B01:0A 85 04 AD AC 82 85 05 58
0B09:20 0F 0B 4C 32 0B A9 80 AA
0B11:85 0B A9 00 85 0A 20 E4 5B
0B19:C1 8A D0 12 20 75 0B AD 88
0B21:00 80 F0 0A 85 04 AD 01 AE
0B29:80 85 05 A9 FF 60 A9 00 F0
0B31:60 A9 01 8D 7C 16 A9 00 6A
0B39:8D 7D 16 20 C9 0D 20 2B 28
0B41:0D 20 8A C1 60 A9 31 8D EC
0B49:B8 84 A9 96 8D B9 84 A9 81
0B51:00 8D BB 84 A9 51 8D BA F2
0B59:84 A9 00 8D BD 84 A9 EE 37
0B61:8D BC 84 A9 00 85 36 A9 C4
0B69:58 85 35 A9 00 85 38 A9 7E
0B71:E7 85 37 60 A9 00 85 FD 20
0B79:A4 FD B9 02 80 F0 29 20 F2
0B81:91 0D A5 03 85 05 A5 02 16
0B89:85 04 A5 FD 18 69 05 85 ED
0B91:02 A9 00 69 80 85 03 A9 73
0B99:00 85 07 A9 10 85 06 20 4F
0BA1:7E C1 EE 7B 16 EE 7E 16 7C
0BA9:A5 FD C9 E0 B0 0A A5 FD 50
0BB1:18 69 20 85 FD B8 50 C0 BE
0BB9:60 A9 00 85 10 85 FD A9 FE
0BC1:90 85 11 AD 7B 16 8D 7E 4C
0BC9:16 A9 00 85 17 A9 00 85 92
0BD1:16 A5 11 48 20 91 0D 68 CC
0BD9:85 11 A5 FD 85 10 A5 03 46
0BE1:85 0F A5 02 85 0E 20 3B 33
0BE9:C2 A9 90 38 E5 11 8D 7B 6B
0BF1:16 E6 FD C9 10 90 CC 4C D1
0BF9:32 0B AD 05 85 30 74 AD 75
0C01:7B 16 F0 6F A9 39 85 06 B4
0C09:A9 7D 85 07 A9 00 85 09 D7
0C11:A9 58 85 08 A9 00 85 0B A8
0C19:A9 E7 85 0A 20 B3 C2 F0 97
0C21:52 A5 3C 38 E9 38 8D 7F A1
0C29:16 A9 00 85 09 A9 0A 85 97
0C31:08 AD 7F 16 85 0A A9 00 B1
0C39:85 0B A0 08 A2 0A 20 69 52
0C41:C1 A5 0A 8D 7F 16 AD 7F EC
0C49:16 18 6D 7C 16 CD 7B 16 DC
0C51:F0 02 B0 1F CD 7D 16 D0 CB
0C59:1B AD 15 85 F0 08 A9 00 60
0C61:8D 15 85 4C 52 0E 20 8F 95
0C69:0C A9 00 8D 7D 16 A9 1E 80
0C71:8D 15 85 60 8D 7E 16 AD 8C
0C79:7D 16 F0 03 20 8F 0C AD 29
0C81:7E 16 8D 7D 16 20 8F 0C 44
0C89:A9 1E 8D 15 85 60 AD 7D 87
0C91:16 F0 39 38 ED 7C 16 8D B6
0C99:7F 16 20 CE 0C AD 7F 16 14
0CA1:18 69 38 8D 7F 16 AD 7F 2F
0CA9:16 85 06 AD 7F 16 18 69 B7
0CB1:09 8D 7F 16 AD 7F 16 85 20
0CB9:07 A9 00 85 09 A9 58 85 3D
0CC1:08 A9 00 85 0B A9 E7 85 F4
0CC9:0A 20 2A C1 60 AD 7F 16 1F
0CD1:0A 0A 18 6D 7F 16 0A 8D 41
0CD9:7F 16 60 AD 7B 16 F0 1D 51
0CE1:AD 7C 16 C9 01 F0 16 AD F4
0CE9:7D 16 F0 0B 38 ED 7C 16 9D
0CF1:C9 06 90 03 CE 7D 16 CE 1A
0CF9:7C 16 20 1C 0D 60 AD 7C 5D
0D01:16 18 69 06 CD 7B 16 B0 F2
0D09:11 AD 7D 16 CD 7C 16 D0 85
0D11:03 EE 7D 16 EE 7C 16 20 2F
0D19:1C 0D 60 AD 7A 16 F0 06 7F
0D21:20 AB 0E B8 50 03 20 2B 7D
0D29:0D 60 AD 7B 16 F0 22 A9 B1
0D31:07 85 FD AD 7C 16 8D 7E A0
0D39:16 20 66 0D AD 7E 16 CD 65
0D41:7B 16 B0 07 EE 7E 16 C6 89
0D49:FD D0 EE 20 8F 0C B8 50 E4
0D51:13 20 AE C1 87 00 57 1B F4
0D59:45 6D 70 74 79 20 44 69 05
0D61:73 6B 21 00 60 20 91 0D E7
0D69:20 81 12 AD 7E 16 38 ED BB
0D71:7C 16 8D 7F 16 20 CE 0C D3
0D79:18 69 3F 85 05 20 2D 0E 4B
0D81:A9 40 85 2E A9 00 85 19 85
0D89:A9 5B 85 18 20 48 C1 60 87
0D91:AD 7E 16 D0 0B A9 18 85 A6
0D99:03 A9 90 85 02 B8 50 27 C4
0DA1:CE 7E 16 AD 7E 16 85 04 BB
0DA9:A9 00 85 03 A9 11 85 02 18
0DB1:A0 04 A2 02 20 63 C1 A9 4D
0DB9:90 18 65 02 85 02 A9 18 8E
0DC1:65 03 85 03 EE 7E 16 60 2E
0DC9:20 A8 C1 05 00 01 58 00 5B
0DD1:38 03 E7 00 7E 00 60 A5 20
0DD9:2E 85 FD A0 00 8C 80 16 7F
0DE1:B1 02 F0 20 C9 1B D0 07 D8
0DE9:A9 00 85 FD B8 50 11 84 17
0DF1:FE A6 FD 20 B1 C1 98 18 D4
0DF9:6D 80 16 8D 80 16 A4 FE 2B
0E01:C8 B8 50 DC A5 37 38 E5 E7
0E09:35 CD 80 16 F0 15 90 13 B4
0E11:38 ED 80 16 4A 18 65 35 E8
0E19:85 18 A5 36 69 00 85 19 85
0E21:B8 50 08 A5 36 85 19 A5 A8
0E29:35 85 18 60 A5 05 18 69 25
0E31:02 85 07 38 E9 09 85 06 98
0E39:A5 36 85 09 A5 35 85 08 0C
0E41:A5 38 85 0B A5 37 85 0A BE
0E49:A9 00 20 39 C1 20 24 C1 6A
0E51:60 A9 0E 8D AA 84 A9 85 E2
0E59:8D A9 84 A9 00 8D A4 84 D5
0E61:A9 00 8D A3 84 A9 FF 8D 96
0E69:7A 16 20 C9 0D 20 A8 C1 E4
0E71:01 58 00 38 07 E7 00 7E FD
0E79:00 AD 7D 16 D0 03 4C 12 4F
0E81:0F 4C E7 0F AD 05 85 30 E2
0E89:20 A9 39 85 06 A9 7D 85 F6
0E91:07 A9 00 85 09 A9 58 85 19
0E99:08 A9 00 85 0B A9 E7 85 D0
0EA1:0A 20 B3 C2 F0 03 4C AB 45
0EA9:0E 60 20 C9 0D 20 2B 0D D1
0EB1:A9 00 8D 7A 16 A9 0B 8D F6
0EB9:AA 84 A9 FB 8D A9 84 A9 07
0EC1:13 8D A4 84 A9 EF 8D A3 73
0EC9:84 60 20 A8 C1 01 58 00 91
0ED1:7E 07 E7 00 38 07 58 00 7A
0ED9:46 00 60 06 5A 00 50 18 11
0EE1:53 74 61 74 75 73 3A 10 36
0EE9:01 58 00 72 02 E7 00 72 E5
0EF1:06 66 00 7B 1B 50 72 65 C6
0EF9:73 73 20 52 45 54 55 52 4E
0F01:4E 20 74 6F 20 63 6F 6E AF
0F09:74 69 6E 75 65 2E 2E 2E 4F
0F11:00 A9 13 8D A4 84 A9 FE 5E
0F19:8D A3 84 20 CB 0E A2 02 57
0F21:20 98 C2 20 81 12 A9 42 B9
0F29:85 05 A9 40 85 2E 20 D8 82
0F31:0D 20 48 C1 A9 0E 85 03 96
0F39:A9 DC 85 02 20 36 C1 A9 3B
0F41:00 85 2E A9 00 85 36 A9 4D
0F49:84 85 35 A9 00 85 19 A9 3E
0F51:84 85 18 A9 58 85 05 AD 41
0F59:C6 88 D0 0B A9 0F 85 03 5F
0F61:A9 BF 85 02 B8 50 08 A9 D5
0F69:0F 85 03 A9 CA 85 02 20 FB
0F71:48 C1 A9 82 85 0D A9 00 35
0F79:85 0C 20 DB C1 A2 0A A0 6C
0F81:02 20 62 C2 A5 0B 85 03 88
0F89:A5 0A 85 02 A9 C0 20 84 E2
0F91:C1 A9 0F 85 03 A9 D7 85 29
0F99:02 20 48 C1 AD 7B 16 85 F2
0FA1:02 A9 00 85 03 A9 C0 20 E3
0FA9:84 C1 A9 0F 85 03 A9 DF 0C
0FB1:85 02 20 48 C1 A9 00 85 D5
0FB9:36 A9 58 85 35 60 57 6F 0A
0FC1:72 6B 20 44 69 73 6B 0D 39
0FC9:00 4D 61 73 74 65 72 20 DC
0FD1:44 69 73 6B 0D 00 6B 20 F0
0FD9:66 72 65 65 0D 00 20 66 D9
0FE1:69 6C 65 73 0D 00 A9 14 83
0FE9:8D A4 84 A9 0D 8D A3 84 8D
0FF1:20 CB 0E AD 7D 16 8D 7E 8D
0FF9:16 20 91 0D A5 03 85 FC 6F
1001:A5 02 85 FB 20 81 12 A9 B9
1009:40 85 2E A9 42 85 05 20 5D
1011:D8 0D 20 48 C1 A5 FC 85 8D
1019:0F A5 FB 85 0E 20 0B C2 CB
1021:8A F0 03 4C AB 0E AD 16 EE
1029:84 D0 06 20 1A 11 B8 50 59
1031:31 A9 84 85 15 A9 00 85 12
1039:14 20 29 C2 A9 40 85 2E 44
1041:A9 53 85 05 A9 00 85 19 7D
1049:A9 5F 85 18 A9 81 85 03 A9
1051:A9 4D 85 02 20 48 C1 A9 B9
1059:81 85 03 A9 04 85 02 20 F0
1061:22 11 AD 16 84 85 02 C9 F5
1069:10 B0 27 A2 02 A9 0D 85 23
1071:04 A0 04 20 60 C1 A9 30 CB
1079:18 65 02 85 02 A9 15 65 DD
1081:03 85 03 A9 5E 85 05 A9 3C
1089:00 85 19 A9 7E 85 18 20 23
1091:48 C1 A9 6C 85 05 A9 00 D5
1099:85 19 A9 7E 85 18 AD 18 DF
10A1:84 85 02 A9 00 85 03 A9 06
10A9:C0 20 84 C1 A9 11 85 03 7E
10B1:A9 36 85 02 20 48 C1 AD 58
10B9:19 84 85 02 A9 00 85 03 B3
10C1:A9 C0 20 84 C1 A9 11 85 8F
10C9:03 A9 36 85 02 20 48 C1 D7
10D1:AD 17 84 85 02 A9 00 85 B3
10D9:03 A9 C0 20 84 C1 AD 1D A3
10E1:84 85 03 AD 1C 84 85 02 E0
10E9:A2 02 A0 02 20 62 C2 90 B0
10F1:0B 18 A9 01 65 02 85 02 23
10F9:90 02 E6 03 A9 77 85 05 2B
1101:A9 00 85 19 A9 5F 85 18 28
1109:A9 C0 20 84 C1 A9 11 85 D8
1111:03 A9 38 85 02 20 48 C1 61
1119:60 A9 11 85 03 A9 3F 85 13
1121:02 A9 03 85 06 A9 15 85 ED
1129:07 A9 0C 85 04 A9 58 85 10
1131:05 20 42 C1 60 2F 00 6B 6D
1139:20 66 69 6C 65 00 BF 7F 23
1141:FF FE A0 00 05 C0 78 03 56
1149:80 F8 01 81 C7 81 81 87 F0
1151:01 81 80 01 81 87 01 81 22
1159:C7 81 80 F8 01 80 78 01 5B
1161:80 00 01 80 00 01 8F 6C 7B
1169:01 8C 0C E1 8C 6D B1 8F DB
1171:6D F1 8C 6D 81 CC 6C F3 3B
1179:A0 00 05 7F FF FE 09 00 92
1181:09 BF AD 7D 16 F0 74 20 23
1189:8D C1 AD 7D 16 8D 7E 16 6A
1191:20 91 0D A5 03 85 FC A5 F1
1199:02 85 FB A9 12 8D A4 84 CC
11A1:A9 0C 8D A3 84 20 C9 0D CC
11A9:20 CB 0E 20 A8 C1 06 5C 47
11B1:00 58 18 59 65 73 20 6F 2B
11B9:72 20 4E 6F 3F 10 06 5C 80
11C1:00 42 44 65 6C 65 74 65 9A
11C9:20 00 A5 FC 85 03 A5 FB FF
11D1:85 02 20 81 12 20 48 C1 B6
11D9:A5 FC 85 03 A5 FB 85 02 19
11E1:A9 16 85 05 A9 00 85 04 BB
11E9:20 02 12 F0 0E A9 16 85 B6
11F1:05 A9 0B 85 04 20 02 12 71
11F9:F0 01 60 20 8A C1 4C AB 82
1201:0E A2 02 A0 04 A9 0A 20 1A
1209:6E C2 60 AD 04 85 C9 79 3F
1211:F0 04 C9 59 D0 64 A5 FC DD
1219:85 03 A5 FB 85 02 20 38 E1
1221:C2 8A D0 56 AD 7D 16 CD 26
1229:7B 16 B0 39 AD 7B 16 8D 4F
1231:7E 16 EE 7E 16 20 91 0D 41
1239:A5 03 85 07 A5 02 85 06 58
1241:A5 FC 85 05 A5 FB 85 04 A4
1249:A5 FB 18 69 11 85 02 A5 21
1251:FC 69 00 85 03 A5 06 38 99
1259:E5 02 85 06 A5 07 E5 03 1A
1261:85 07 20 7E C1 CE 7B 16 4C
1269:A9 00 8D 7D 16 CE 7C 16 E6
1271:AD 7C 16 D0 05 A9 01 8D B9
1279:7C 16 20 8A C1 4C AB 0E B2
1281:A0 10 88 B1 02 F0 16 C9 EF
1289:20 B0 02 A9 1B C9 A0 D0 D6
```

```
1291:02 A9 00 C9 80 90 06 38 48
1299:E9 80 B8 50 EA 99 AE 12 1C
12A1:C0 00 D0 DE A9 12 85 03 D1
12A9:A9 AE 85 02 60 00 00 00 22
12B1:00 00 00 00 00 00 00 00 D5
12B9:00 00 00 00 00 00 AD 8D C6
12C1:84 18 69 08 85 02 AC 89 F2
12C9:84 C8 C4 02 90 02 A0 08 F0
12D1:B9 86 84 29 0F CD 87 16 6C
12D9:F0 07 AD C4 88 29 40 F0 94
12E1:E8 98 20 B0 C2 8A F0 06 D7
12E9:EE 89 84 B8 50 D0 20 A1 AB
12F1:C2 8A D0 CA 4C C9 0A AD 2C
12F9:89 84 8D 86 16 A8 B9 86 6B
1301:84 29 0F 8D 87 16 AD 8D EB
1309:84 C9 02 D0 23 AD 0F C0 DF
1311:C9 20 90 1C AD 90 84 F0 A1
1319:17 29 0F 85 02 AD 8E 84 B7
1321:29 0F C5 02 F0 07 AD C4 3C
1329:88 29 40 F0 03 EE 8D 84 68
1331:60 AD 86 16 20 B0 C2 8A F8
1339:D0 14 20 A1 C2 8A D0 0E DA
1341:A9 16 85 0F A9 00 85 0E C9
1349:20 0B C2 8A F0 03 4C C9 39
1351:0A 20 C9 0D A9 40 85 2E 16
1359:20 AE C1 6F 00 58 43 6F C1
1361:70 79 72 69 67 68 74 20 E8
1369:28 63 29 20 31 39 39 30 B4
1371:00 20 AE C1 6E 00 65 43 13
1379:4F 4D 50 55 54 45 21 27 1B
1381:73 20 47 61 7A 65 74 74 2F
1389:65 00 AD 8D 84 C9 03 90 D2
1391:05 A9 02 8D 8D 84 2C 79 0E
1399:16 10 1A A9 16 85 0F A9 3B
13A1:0B 85 0E A9 00 85 02 20 45
13A9:08 C2 A9 16 85 03 A9 0B B1
13B1:85 02 20 38 C2 20 B7 C1 6A
13B9:88 16 F0 8C 08 02 20 DA F3
13C1:13 4C 3E C2 A5 FC 8D 83 38
13C9:16 A5 FB 8D 82 16 A5 FE 73
13D1:8D 85 16 A5 FD 8D 84 16 82
13D9:60 AD 83 16 85 FC AD 82 6B
13E1:16 85 FB AD 85 16 85 FE 5D
13E9:AD 84 16 85 FD 60 A9 12 F9
13F1:85 04 A9 14 85 03 A9 4A 28
13F9:85 02 4C 1C 14 A9 09 85 8D
1401:04 A9 14 85 03 A9 5C 85 6D
1409:02 4C 1C 14 A9 0C 85 04 96
1411:A9 14 85 03 A9 65 85 02 E3
1419:4C 1C 14 AD 04 85 F0 25 09
1421:8D 81 16 A0 00 B1 02 CD D5
1429:81 16 F0 0A C8 C8 C8 C4 16
1431:04 F0 12 B8 50 EF C8 B1 EA
1439:02 8D 48 14 C8 B1 02 8D AE
1441:49 14 B8 50 01 60 4C FF 51
1449:FF 11 FF 0C 10 DC 0C 78 FA
1451:83 11 64 C9 0A 44 BF 12 9B
1459:3F 52 0E 0D AB 0E 11 FF FF
1461:0C 10 DC 0C 0D AB 0E 78 9B
1469:83 11 11 FF 0C 10 DC 0C 20
1471:04 5C 00 87 0D 15 0B 83 81
1479:02 10 FF 0C EA 14 0E 83 AE
1481:02 10 DC 0C C8 14 11 83 47
1489:02 10 52 0E 95 14 1A 83 96
1491:03 10 32 13 B0 7F FF FE 39
1499:C0 00 03 80 00 01 80 00 8F
14A1:01 9E 00 01 9E 03 61 98 5E
14A9:00 61 9E DB 71 9E DB 61 DA
14B1:98 73 61 9E DB 61 9E DB 96
14B9:31 80 00 01 80 00 01 C0 71
14C1:00 03 7F FF FE 06 BF 90 BA
14C9:7F FE C0 03 80 01 80 01 C3
14D1:83 C1 86 61 80 61 80 C1 5F
14D9:04 81 8C 80 01 81 81 80 8F
14E1:01 80 01 C0 03 7F FE 04 EE
14E9:BF A0 7F FE C0 03 80 01 0E
14F1:80 01 81 81 83 C1 87 E1 F6
14F9:8F F1 83 C1 83 C1 83 C1 DE
1501:83 C1 80 01 80 01 C0 03 0A
1509:7F FE 04 BF A0 7F FE C0 F0
1511:03 80 01 80 01 83 C1 83 22
1519:C1 83 C1 83 C1 8F F1 87 2D
1521:E1 83 C1 81 81 80 01 80 FD
1529:01 C0 03 7F FE 04 BF 4E 32
1531:4F 54 20 47 45 4F 53 00 9E
1539:00 00 00 00 42 41 53 49 6A
1541:43 00 00 00 00 00 00 00 0D
1549:00 41 53 53 45 4D 42 4C 93
1551:59 00 00 00 00 00 44 41 F1
1559:54 41 00 00 00 00 00 00 FD
1561:00 00 00 53 79 73 74 65 A8
1569:6D 00 00 00 00 00 00 00 4A
1571:44 65 73 6B 20 41 63 63 6C
1579:65 73 73 2E 00 41 70 70 DA
1581:6C 69 63 61 74 69 6F 6E 55
1589:00 00 41 70 70 6C 2E 20 94
1591:44 61 74 61 00 00 00 46 21
1599:6F 6E 74 00 00 00 00 00 A5
15A1:00 00 00 00 50 72 69 6E 59
15A9:74 65 72 00 00 00 00 00 B5
15B1:00 49 6E 70 75 74 20 44 05
15B9:72 69 76 65 72 00 44 69 22
15C1:73 6B 20 44 72 69 76 65 54
15C9:72 00 00 53 79 73 74 65 4A
15D1:6D 20 42 6F 6F 74 00 00 47
15D9:54 65 6D 70 6F 72 61 72 B6
15E1:79 00 00 00 00 41 75 74 2D
15E9:6F 2D 45 78 65 63 00 00 FF
15F1:00 00 49 6E 70 75 74 20 8E
15F9:31 32 38 00 00 00 00 1B 6B
1601:53 77 61 70 20 46 69 6C 41
1609:65 00 1B 44 51 20 42 75 94
1611:66 66 65 72 00 0B 16 03 39
1619:15 BF FF FF FF 80 40 01 43
1621:80 60 01 80 60 01 80 60 36
1629:0D 80 50 35 80 50 D9 80 D2
1631:53 21 80 5C C1 80 59 01 E8
1639:87 CE 01 9F C8 01 B8 F8 AB
1641:01 B1 FC 01 BF 6E 01 9C 60
1649:66 01 80 66 01 80 6C 01 43
1651:80 38 01 80 00 01 FF FF F7
1659:FF 83 0D 00 80 A7 C0 B7 E3
1661:00 00 49 6D 61 67 65 20 21
1669:53 63 72 61 70 20 56 31 5E
1671:2E 31 00 00 00 00 00 00 01
```

G

VIDEO BYTE II the only FULL COLOR! video digitizer for the C-64, C-128

Introducing the world's first **FULL COLOR!** video digitizer for the Commodore C-64, 64-C, C-128 & 128-D computer. **VIDEO BYTE** can give you digitized video from you V.C.R., LASER DISK, B/W or COLOR CAMERA or OFF THE AIR or CABLE VIDEO (thanks to a fast! 2.2 sec. scan time). New version 3.0 software features full RE-DISPLAY with MULTI CAPTURE MODE, MENU SELECT PRINTING, EXPANDED COLORIZING FEATURES, SAVE to DISK feature and much more!

FULL COLORIZING! Is possible, due to a unique SELECT and INSERT color process, where you can select one of 15 COLORS and insert that color into one of 4 GRAY SCALES. This process will give you over 32,000 different color combinations to use in your video pictures. **SAVES as KOALAS!** Video Byte II allows you to save all your pictures to disk as FULL COLOR KOALA'S. After which (using Koala or suitable program) you can go in and redraw or color your V.B. pic's. **LOAD and RE-DISPLAY!** Video Byte II allows you to load and re-display all Video Byte pictures from inside Video Byte's menu. **MENU DRIVEN!** Video Byte II comes with easy to use menu driven UTILITY DISK with V3.0 digitizer program. (64 MODE ONLY). **COMPACT!** Video Byte II's hardware is compact! In fact no bigger than your average cartridge! Video Byte comes with it's own cable. **INTEGRATED!** Video Byte II is designed to be used with or without EXPLODE! V5.0 color cartridge. Explode! V5.0's menu will return you to VIDEO BYTE II's menu. EXPLODE! V5 is the **PERFECT COMPANION!** Video Byte II users are automatically sent **FREE SOFTWARE** updates along with new documentation, when it becomes available. **PRINT!** Video Byte II will printout pictures in BLACK and WHITE GRAY SCALE to most printers. However when used with Explode! V5.0 your printout's can be done IN FULL COLOR 8 by 11's SIDEWAYS on the **RAINBOW NX-1000, RAINBOW NX-1000C, JX-80, Seikosha 3000 AI. (OKIDATA 10/20's (print larger 6" by 9") USER SLIDE SHOW program w/auto or manual display is standard with VIDEO BYTE program. And can be backed up!)**

Why DRAW a car, airplane, person or for that matter . . . anything when you can **BYTE it . . . VIDEO BYTE it instead!**

ONLY **$79.95**

Circle Reader Service Number 119

NEW! SUPER CARTRIDGE by The Soft Group EXPLODE! V.5

The **MOST POWERFUL, DISK DRIVE and PRINTER CARTRIDGE** ever produced for the COMMODORE USER. Super **USER FRIENDLY** with all the features most asked for.

New FEATURES. . . (a) Faster non-blanking FASTLOAD. (b) MIRROR imaging of all HI-RES screens. (c) 4 Way color selection with insert, for all HI-RES screens. (d) Infinite FILE COPY for all SEQ. & PRG. files, copy your file only once, then write that file to as many disks as you like. . . great for single file copying by small user groups. (e) **FULL COLOR PRINTING of ALL COLOR HI-RES & MULTI-COLOR SCREENS to ALL COLOR DOT MATRIX PRINTERS** (not for INK JET printers). (f) Direct ONE KEY access back to VIDEO BYTE software thru EXPLODE! V5.0's 2nd MENU. (g) Supports all popular printer interfaces. (h) FREE upgraded utility disk.

SUPER **FASTLOAD** and **SAVE** (50K-9 SEC'S) works with **ALL C-64 or C-128's NO MATTER WHAT VINTAGE** or disk drives EXCEPT the 1581, M.S.D. 1 or 2. SUPER **FAST FORMAT** (8 SEC'S). - plus FULL D.O.S. WEDGE w/standard format! SUPER **SCREEN CAPTURE.** Capture and Convert **ANY SCREEN** to KOALA/DOODLE. SUPER **PRINTER FEATURE** allows ANY DOT MATRIX PRINTER even 1526/802 to print HI-RES SCREENS in FULL COLOR (using 16 shade GRAY SCALE). **ANY PRINTER or INTERFACE COMBINATION** can be used with SUPER EXPLODE! V5.0. NEW and IMPROVED **CONVERT** feature allows anybody to convert (even TEXT) **SCREENS into DOODLE or KOALA TYPE PICTURES w/FULL COLOR!** SUPER **FAST SAVE** of EXPLODE! SCREENS as KOALA or DOODLE FILES w/COLOR. SUPER **FAST LOADING** with **COLOR RE-DISPLAY of DOODLE or KOALA** files. SUPER FAST LOAD or SAVE can be turned OFF or ON without AFFECTING the REST of SUPER EXPLODE'S FEATURES. The rest of Explode! V5.0 is still active. SUPER **EASY LOADING and RUNNING** of ALL PROGRAMS from the DIRECTORY. SUPER **BUILT-IN TWO WAY SEQ. or PRG. file READER** using the DIRECTORY. NEVER TYPE a FILE NAME AGAIN when you use SUPER EXPLODE'S unique LOADERS.

CAPTURE 40 COLUMN C or D-128 SCREENS! (with optional DISABLE SWITCH).

All the above features, and much more!

PLUS A FREE UTILITY DISK w/SUPER EXPLODE!

MAKE YOUR C-64, 64-C or C-128*, D-128* SUPER FAST and EASY to use. THE BEST THING of ALL . . . IS THE PRICE!!! still only $44.95 or w/disable $49.95.

*Note UP GRADES for V5.0 are offered to V4.1 owners only. $20.00, w/dis add $5.

**Note V4.1 owners w/disable will be sent V5.0 w/disable for only $20.00

ONLY **$44.95**

All units come w/90 day WARRANTY. All orders add $3 for UPS BLUE LABEL S/H. UPS BLUE available only in 48 states. FOREIGN ORDERS are US FUNDS +$6.35 S/H. ORDER BOTH EXPLODE! V5 & VIDEO BYTE II together and receive FREE!! UPS S/H. ***Note all SALES are FINAL, 90 DAY WARRANTY covers PARTS & LABOR ONLY. All SOFT GROUP UTILITY DISKS COME w/built-in CATALOG of PRODUCTS.

* IN 64 MODE ONLY **TO ORDER CALL 1-708-851-6667** IL RESIDENTS ADD 6% SALES TAX

PLUS $3.00 S/H. NO C.O.D.'S. FOREIGN ORDERS U.S. FUNDS ONLY $6.35 S/H. Personal Checks 10 Days to Clear

MasterCard VISA

THE SOFT GROUP, P.O. BOX 111, MONTGOMERY, IL 60538

64 Doctor

A professional diagnostic cartridge for your Commodore 64

- Simply insert cartridge & port connectors
- Tests serial, user and control ports
- Allows for a full keyboard test
- Many chips tested including NMI & IRQ
- Sound channels and graphics tested
- BASIC Kernal & ROM tested
- Screen table clearly displays the results
- All defective chips are highlighted
- Location and CBM part numbers displayed
- Buy the parts and repair it yourself
- Or tell your dealer what's wrong & where

$69.95

UTILITIES UNLIMITED, Inc.

P.O. Box 532
North Plains, OR 97133

If you wish to place your order by phone
CALL (503) 647-5611 24 Hrs A Day!

NEW!

SUPER TRACKER

At last an easy way to find out where the protection really is. **Super Tracker** will display the location of your drive head while you are loading a piece of software. This information will be very useful to find where the protection is. Super Tracker has other useful options such as track and half track display, 8 and 9 switch, density display, write protect on/off. This incredible little tool is encased in a handsome box that sits on top of your drive. Works with all C.64/128 and most C/64 compatible drives. Some minor soldering will be required.

Super Tracker **$69.95**

NEW!

SUPER CARTRIDGE

The **Ultimate Utility Cartridge** packed full of useful utilities. Super fast file copier, nibbler, sector editor, graphic label maker, just to mention a few. 128K of software at your finger tips. Super Cartridge can be shut off and uses no memory.

Super Cartridge **$49.95**

GRAPHIC PACK **$24.95**

Our best selling graphic programs plus more, all on one disk. **Graphic label maker, Photo-Copy, Super Label, Converter** (converts Print Shop to Print Master), and **Sprite Editor.** Plus we'll add 60 graphics.

PARAMETERS CONSTRUCTION SET

The company that has **The Most Parameters** is about to do something **Unbelievable.** We are giving you more of our secrets. Using this **Very Easy** program, it will not only **Read, Compare** and **Write Parameters for You;** it will also **Customize** the disk with your name. It will impress you, as well as your friends. The **"Parameter Construction Set"** is like nothing you've ever seen. In fact, you can even **Read Parameters** that you may have already written; then by using your construction set, rewrite it with your new **Customized Menu. $24.95.**

New from Europe

XX Rated Game	$24.95	Lock Pik Books 1 & 2	29.95
All New B.B.S.	19.95	D.N. Coder	14.95
Super 1000 Paramters Pak	39.95	Master Lock	9.95
Super 1000 Graphics Pak	29.95		
Blitz Decompiler	19.95		
1541 Mash Drive Alignment	14.95		
Top Secret Stuff 1 & 2	14.95		

ADD $4.00 Shipping & Handling
ADD $3.00 for C.O.D. in USA Only
VISA and MasterCard Accepted

SUPER-CARD +

Have you been watching the war over the "best" backup utility? We would like to state the facts, and put this war to an end . . . once and for all!

- Utilities Unlimited was the FIRST to create a fully functional whole track copier. Our prototype was designed December 6, 1984. Since that time, the product has evolved into the most successful archiver ever created!
- Ultilities Unlimited was FIRST in creating this product for ALL disk drives: 1541/1541C/1541-II/1571/SX-64/ALL Commodore compatibles. While it is true that some of the units required soldering, it is very simple. We offer an installation service for those customers that do not wish to install the card themselves.
- Why would you WANT to wait for parameters? During that waiting period, your precious software could be destroyed! With **SUPER-CARD+** you need not wait! The software is user selectable. So if special changes are required, you can do it yourself! NO WAITING FOR MONTHS. What about those special changes? They (if actually required) are available by calling our office, or through QUANTAM LINK. We can tell you how to backup your software THE SAME DAY YOU GET IT! All versions of our **SUPER-CARD+** software include the latest settings. Even our competitor agrees that we can copy EVERYTHING with the proper settings . . . and we have them!
- Updates — Approximately every 6 weeks we release an update of our software that includes new utilities, copiers, and settings. ALL updates are $5.00... which we feel is a very reasonable fee. Updates are NOT required.
- Across the nation, software rental stores use **SUPER-CARD+** to backup their originals. Our **SUPER-CARD+** has been tested in Europe and has been chosen as the BEST backup utility!
- **SUPER-CARD+** comes complete with the hardware card, documentation, and the latest software release (version 3.0).

So, the facts are on the table . . . you decide for yourself. By the way, they say that *"imitation is the highest form of flattery"* . . . thanks guys!

ONE BOARD FITS ALL DRIVES

Single.....$59.95 Dual.....$109.95

FINAL CARTRIDGE III

No other cartridge adds 64K of ROM. The additional 32K of RIM is dedicated to a unique desk top accessory, setting it apart from the other cartridges.

Final Cartridge III is inspired by the Amiga and Macintosh. The function keys are laid out logically and are easy to remember. The tool kit is the largest collection on any cartridge (almost 30 commands). Just to mention some of the features — Fastload (15X) Backup, Freezer, Printer FR, Word Problems, Pop-Up Calculator, Color Screen Dump and Windows. **All for only $69.95**

Allow 3-4 Weeks for Delivery
All Sales Are **FINAL**
Unless Authorized by Management

VIDEO BYTE II - the only FULL COLOR! video digitizer for the C-64, C-128

Introducing the world's first **FULL COLOR!** video digitizer for the Commodore C-64, 64-C, C-128 & 128-D computer. **VIDEO BYTE** can give you digitized video from your VCR, B/W or COLOR CAMERA or OFF THE AIR or CABLE VIDEO (thanks to a fast! 2.2 sec. scan time). New version 3.0 software features full RE-DISPLAY with MULTI CAPTURE MODE, MENU SELECT PRINTING, EXPANDED COLORIZING FEATURES, SAVE to DISK FEATURE AND MUCH MORE!

FULL COLORIZING! is possible, due to a unique SELECT and INSERT color process, where you can select one of 15 COLORS and insert that color into one of 4 GRAY SCALES. This process will give you over 32,000 different color combinations to use in your video pictures. **SAVES as KOALAS!** Video Byte II allows you to save all your pictures to disk as FULL COLOR KOALA'S. After which (using Koala or suitable program) you can go in and redraw or recolor your V.B. pic's. **LOAD and RE-DISPLAY!** Video Byte II allows you to load and re-display all Video Byte pictures from inside Video Byte's menu. **MENU DRIVEN!** Video Byte II comes with an easy to use menu driven UTILITY DISK and digitizer program (64 MODE ONLY). **COMPACT!** Video Byte II's hardware is compact! In fact no bigger than your average cartridge! Video Byte comes with it's own cable. **INTEGRATED!** Video Byte II is designed to be used with or without EXPLODE! V5.0 color cartridge. Explode! V5.0's menu will return you to VIDEO BYTE II's menu. Explode! V5.0 is the **PERFECT COMPANION!** Video Byte II users are automatically sent **FREE SOFTWARE** updates along with new documentation, when it becomes available. **PRINT!** Video Byte II will printout pictures in BLACK and WHITE GREY SCALE to most printers. However, when used with Explode! V5.0, your printouts can be done IN FULL COLOR 8x11's on the **RAINBOW NX-1000, RAINBOW NX-1000C, JX-80, Seikosha3000 AI. (OKIDATA 10/20's (print larger 6"by9") USER SLIDE SHOW program w/auto or manual display is standard with VIDEO BYTE program. And can be backed up!)**

ONLY $79.95

Why DRAW a car, airplane, person or for that matter. . . anything when you can **BYTE it . . .Video Byte it instead.**

NEW! SUPER CARTRIDGE By The Soft Group EXPLODE! V.5

The **MOST POWERFUL, DISK DRIVE and PRINTER CARTRIDGE** ever produced for the COMMODORE USER, Super **USER FRIENDLY** with all the features most asked for. New FEATURES. . . (a) Faster non-blanking FASTLOAD. (b) MIRROR imaging of all HI-RES screens. (c) 4 Way color selection with insert, for all HI-RES screens. (d) Infinite FILE COPY for all SEQ. & PRG. files, copy your file only once, then write that file to as many disks as you like. . . great for single file copying by small user groups. (e) **FULL COLOR PRINTING of ALL COLOR HI-RES & MULTI-COLOR SCREENS to ALL COLOR DOT MATRIX PRINTERS** (not for INK JET printers). (f) Direct ONE KEY access back to VIDEO BYTE software thru EXPLODE! V5.0's MENU. (g) Supports all popular printer interfaces. (h) FREE upgraded utility disk.

ONLY $44.95

THE 128 SUPERCHIP - A, B or C (another first)

A — There is an empty socket inside your 128 just waiting for our **Super Chip** to give you 32K worth of great Built-in Utilities, all at just the Touch of a Finger. You get built-in features: **Files Copier, Nibbler, Track & Sector Editor, Screen Dump,** and even a 300/1200 baud **Terminal Program** that's 1650, 1670 and Hayes compatible. Best of all, it doesn't use up any memory. To use, simply touch a function key, and it responds to your command.

B — HAS SUPER 81 UTILITIES, a complete utility package for the 1581. Copy whole disks from 1541 or 1571 format to 1581. Many options include 1581 disk editor, drive monitor, Ram writer and will also perform may CP/M & MS-DOS utility functions.

C — "C" IS FOR COMBO and that's what you get. A super combination of both chips A and B in one chip, switchable at a great savings to you. **All Chips Include 100 Parameters FREE!** Chips A or B: **$29.95 each** Chip C: **$44.95 each.**

Circle Reader Service Number 139

horizons

Send Me Mail

Rhett Anderson

Periodically, I encourage "Horizons" readers to send me mail. I enjoy hearing what you have to say. As a bonus, if I get enough mail, I can get away with letting my readers do my work for me. That's what has happened this month. I hereby dedicate this column to those authors who have contributed to it.

But first, a bit of "Horizons" history for those who may have missed some recent columns.

In September, I thanked Berkeley Softworks for its support of the 8-bit Commodore market at a critical time. I also pointed out that Berkeley was leaving the market to head for greener pastures. Well, as it turns out, the company has not made a full retreat. A letter from Berkeley (see "RAM and More from Berkeley") clarifies the situation.

In November, I declared open season on the less-than-aesthetic Commodore 64 case. I offered three prizes for readers who sent in photos of their overhauls. Amazingly, no one wrote in defense of the Commodore 64's looks. As I write this, the deadline for entries draws near. (I'm writing this on November 14, 1989, and the deadline is January 31, 1990.) I've received one entry so far, and it's a worldbeater. I look forward to seeing more entries. I won't spoil Dennis Joslin's chances in the contest by giving away any details, but just to give you a taste of the scope of his design, I've printed the first and last paragraphs of his letter (see "The Computer's New Clothes").

In December, I made the offhand remark "Do you think that the shampoo instructions 'Wet hair. Lather. Rinse. Repeat.' form an infinite loop?" Staff programmer Tim Midkiff let me know that David Letterman has already covered this ground. Regrettably, I missed that show, but I learned plenty about the subject after receiving *Gazette* reader T. D. Winter's treatise on the subject, parts of which I excerpt here.

The Shampoo Loop

This letter delves deeply into the mystery of misleading product labels. You may never look at a shampoo bottle in the same way again.

You brought up a very interesting subject in your December 1989 "Horizons" column—one that has been bugging me for a long time. Are the shampoo instructions "Wet hair. Lather. Rinse. Repeat." an infinite loop? At first it seemed to be a very trivial question, but the more I thought about it, the more I realized that the problem addressed some very important influences of modern computer technology on mankind. Have computers taught us to organize our thinking processes into logical, systematic patterns, or have we lost that special, irrational SOMETHING that makes us human? Let's analyze the problem from the start.

The simple instructions "Wet hair. Lather. Rinse. Repeat." are obviously clear enough for the majority of shampoo users, because they are not literally followed. If they were, people would be stuck in their showers until their shampoo ran out. The loop has no test condition.

According to the book Learning Pascal, *by Niedelman and Carnine, "If some portion of the test condition is not changed inside the loop, the test will have the same result each time it is encountered and an infinite loop will result" (p. 234). This is obviously the case with our shampoo problem.*

But not all shampoos are created equal. St. Ives Laboratories was more elaborate in its instructions: "Apply Swiss Formula Jojoba Shampoo to damp hair and work up a rich, cleansing lather. Rinse thoroughly and repeat if necessary." They included a legitimate test condition; however, they still leave it up to the user to define his or her own criteria of when exactly enough is enough. The loop has indeed the potential of becoming infinite, because the possibility exists that the user will never achieve the desired results.

Why is this not acceptable anymore? Are we subconsciously trying to implement the pure number-logic of the computer? I think so, and I also think it will only get worse (or better, depending on your point of view) as mankind advances into the increasingly more computerized world of tomorrow.

Some people may feel threatened by this, but I think it is the logical next step in the eternal process of natural selection. "Artificial Intelligence" is progressing in a negative direction—computers should not be taught to think like us, but vice versa.

The author of this letter, T. D. Winter of Pocatello, Idaho, went into more depth than I can print here, but thanks, T. D., for a well-thought-out and interesting letter.

The Computer's New Clothes

Here are the first and final paragraphs of the letter that accompanied Dennis Joslin's 64-overhaul entry.

Enclosed is a picture of my redesigned Commodore system. I call it the Commodore 64-AS for Awesome System or Advanced System, based on personal preference.

[Details of construction omitted.]

And there you have it, my secret formula for making the Commodore 64-AS for about six bucks.

Exciting, isn't it? Let's see more entries, folks.

RAM and More from Berkeley

I'd like to thank Leland Llevano from Berkeley Softworks (the GEOS folks), who read my September column and sent me the following letter.

First, I want to thank you for complimenting our efforts in your September column.

Second, I'd like to clear up a few misconceptions.

Berkeley Softworks is still committed to the Commodore market. Granted, it's not 100 percent of our focus, but we are doing what we can to stimulate continued interest in the Commodore 64/128. A few points:

- *The fire-sale prices at the World of Commodore Show were only on older, discontinued titles. There are still a lot of people out there who haven't caught the GEOS "fever," and we wanted to make the price of entry as low as possible.*
- *We've already produced applications in all the major productivity categories and substantially upgraded our flagship products GEOS and GEOS 128.*
- *geoBasic, a reportedly axed product, is still alive. Our current plan is to release it through mail order in 1990.*
- *Look for a new product from us in December [1989], geoRAM 512, our own RAM Expansion Unit.*

We appreciate the plaudits, but don't close the curtain on us yet. Where we can, we plan to keep the show going.

Enclosed with the letter was an ad for the geoRAM expansion board; 512K is a lot of RAM, and the price ($124.95) is a bargain. Good work, and merci, Berkeley. Readers can call (800) 888-0848 to order. **G**

d'iversions

Design-a-Robot Contest

Fred D'Ignazio

When I was a little kid, the only robots I saw were on TV and in the movies. Back then there were no real robots, only robots of fantasy and science fiction—robots like Robbie, Tobor, Klaatu, and Gog. That didn't stop me from trying to build a robot of my own. I scavenged parts from old bicycles, washing machines, photocopiers, and toasters. I once even used a bedpan as a robot's body. During school, I daydreamed about building a robot of my own—a man Friday, a servant, a buddy, a friend. At night, robots invaded my dreams.

When I grew up, I learned that while I was dreaming up make-believe robots, real robots were being built in laboratories and plants in the U.S., Europe, and Japan. The real robots looked like long, skinny sea monsters with pliers for jaws. They were called robot *arms* and were bolted to factory floors. They were programmed to paint cars, do spot welding, and lift heavy objects.

Other robots were built by our fledgling space program, NASA, and launched into outer space. Whether in space or on Earth, robots journeyed into places where humans could not go—into the poisonous atmosphere of Venus, the crushing gravitational pressure of Jupiter, deep under the oceans, into the cores of nuclear reactors, into cells held by rioting prisoners, or into bus depots evacuated by a bomb threat. Robots could be manipulated by humans from as close as a few feet or as distant as several million miles. They were humans' remote eyes, ears, and bodies. They became a sort of human *telepresence* that could explore the universe and take risks we humans dared not take.

Robot designers began looking for "3-D" (Dull, Dirty, and Dangerous) jobs for robots to fill. Robots never got sick, they didn't take coffee breaks, they had an infinite attention span, and they could work three 8-hour shifts without dropping. Bosses liked them because they never talked back, they didn't go on strike, and they didn't belong to a union.

The Rise and Fall of Personal Robots

All of these outer-space, undersea, and factory robots were neat, but they weren't what I really wanted. I wanted a personal robot—a robot sidekick like C3PO or R2D2, or like Vincent in Walt Disney's *The Black Hole*.

For a while, in the early 1980s, it looked as if I would get my wish. As personal computers grew in popularity, a new field of personal robotics emerged. An International Personal Robotics Congress was held in Albuquerque, New Mexico, in April 1984. The following two years, personal robots were everywhere. Every week new robots came to my house in Roanoke, Virginia, so that I could review them for *Gazette* or for the TV program I was on, "The New Tech Times." When the show's TV crew arrived, I would plug the robots into my Commodore 64, turn them on, and let them roam around the house. For one of the TV shows, I had 27 robots (monkeys, turtles, dogsters, catsters, bootsmen, robo-balls, Heros, Topos, Robies, and others) all running at once.

That's when I wrote the *Gazette* cover story, "My Robot Hotel." My robot guests were yipping, beeping, bumping into walls, talking to trash cans, and chasing the family cat. The house was a mess, my wife was alarmed, and my children were running after the robots, giggling. And me? I was in seventh heaven. My childhood dreams had (almost) come true.

But then the bottom fell out in the personal robotics business. No new guests came to stay at my robot hotel. The hotel was empty and silent. I was sad. I missed the whirr and buzz of the robots' little motors, their tire tracks across my scrambled eggs in the morning, the occasional wandering robot who ended up stuck in the bathtub, wedged under the toilet, or lost among the galoshes in the back of the closet. I missed their chipper voices, their songs (like "Old MacDonald Had a Robot"), and their clever remarks when they encountered the broom or the cat. ("Hi!" they'd say. "Are you a human being?")

Robots Reborn

I can wait no longer. If the robot revolution doesn't happen on its own, I'll have to make it happen myself. I'm officially launching the Great Design-a-Robot Contest. It begins right now—as you read these words.

Entering the contest is easy. All you have to do is invent a new *personal* robot. It can be completely original or a combination of all the robots you've seen, dreamed about, or imagined.

You have to draw a picture of the robot. Label all of its interesting parts and describe what each does. Furthermore, I want you to show me how the robot relates to your Commodore 64 or 128 computer. Does the computer control the robot? Does it program the robot? If so, how? How are the signals and commands transmitted and received? What kind of programming language should the robot use? Can you invent some commands on your own?

Along with the robot's diagram, I would like a short description of what robots mean to you. Reach down into your heart. What would you do if you had a robot just like the one you've designed? Be specific. Be imaginative. Be wild.

The Winners?

Please send your contest entry to

The Great Design-a-Robot Contest
COMPUTE!'s Gazette
324 W. Wendover Ave.
Suite 200
Greensboro, NC 27408

It's not mandatory, but I'd like to see your entries (text, pictures, diagrams, and so forth) all done on a Commodore 64 or Commodore 128. I don't care if you do some cutting and pasting on real paper at the end, just as long as it looks neat.

I'll judge all the entries myself and send them around to a few other robot maniacs to evaluate. The contest winner and ten runners-up get the following:

1. Their robots will be featured in a future column in *Gazette*.
2. I will send their robot designs to Commodore, Nintendo, and others, and I will personally lobby the companies to get busy building them.
3. I will award the first-place winner a big personal robot and each of the runners-up a little personal robot (of current design).

So let's get busy. If you love robots as much as I do, please help me jumpstart a new robot revolution. As we enter the 1990s, let's pioneer a new Age of Personal Robots. **G**

THE programmer's page

Bugs

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

It's 1:00 a.m. and you're busy tracking a bug that's been plaguing your program for weeks. After checking and double-checking your code for typos, logical mishaps, and errant subroutines, you suddenly realize that the flaw is not in your program at all, but in the computer itself. You've just discovered a bug in Commodore BASIC.

It's true: Commodore BASIC isn't perfect. Listed below are two programs that exemplify this fact. Type in and run the following program on a 64 to observe the unexpected results:

```
10 A = 8388608.88
20 PRINT A * 1
30 PRINT 1 * A
```

As you can see, the answers given by this program are not entirely accurate. This mathematical slipup is caused by the computer's binary-to-decimal conversion routines. Certain decimal numbers, such as 8388608.88, are simply too difficult for the 64's floating-point routines to handle reliably.

Now try this one:

```
10 A$ = "1E99":REM DISAPPEARING
   REMARK
20 PRINT VAL(A$)
```

When you run this two-line program, the computer responds with an overflow error. Then, when you relist it, the remark statement and ending quotation mark in line 10 are missing. This has to do with a bug in the VAL statement.

Here's a brief explanation of what's going wrong: Before VAL evaluates strings, it stores a zero byte after the last character in the string to signify the end of the string. Because A$ is explicitly defined in line 10, the storage space for A$ is actually within the program itself. This type of variable is sometimes referred to as a *static* variable. When a 0 is placed after the character 9, it replaces the closing quotation mark. This quote, however, is preserved so that it may be restored later on.

Because the number 1E99 (this is scientific notation for a 1 followed by 99 zeros) is too large for BASIC to handle, the computer returns an overflow error when the program is run. Here's where the bug comes in: When the VAL routine encounters an error, it immediately gives up, never bothering to restore the character replaced with a zero byte. In the case of the program above, this error effectively removes line 10's closing quotation mark from memory. And because a 0 marks the end of a BASIC line, VAL has truncated the last portion of the line.

I was originally alerted to these two bugs by volume 8, issue 9 of the 8-bit *Transactor*. Fortunately, I discovered them before they discovered me.

The 128 is not without its problems, either. Although many of the old 64 bugs have been removed from the 128, many new ones were introduced with the computer's enhanced BASIC. For example, INPUT# can no longer be used to input characters from device 3 (the screen); the SCNCLR command doesn't properly fill color memory on a GRAPHIC 4 screen; and DEF FN statements that appear prior to a GRAPHIC 1,1 (or 2,1 or 3,1 or 4,1) produce a syntax error when you try to use the function later on.

You're Not Alone

Don't think that as a Commodore owner you're the only one inflicted with such insidious programming obstacles. Microsoft—the software giant that created MS-DOS and several other PC-oriented products—wrote BASIC for the Apple II, TRS-80, and IBM PC, as well as for Commodore. As a result, anyone who uses BASIC on the Apple, TRS-80, PET, or VIC-20 has to deal with the same bugs that are demonstrated by the programs given above.

Actually, Commodore owners have it pretty good. The original BASIC for the Atari 800 series was rife with errors. Certain functions, such as NOT, simply didn't work. (It was actually stated in some manuals that you were *not* to use NOT.) And how about Atari ST BASIC? You can still crash an ST simply by printing the number 18.9 or any multiple of 18.9! As one COMPUTE! employee put it when he heard that Atari was late in coming out with an ST BASIC upgrade, "They must still be trying to work in those last few bugs."

Calling All Bugs

Known bugs are relatively harmless. If you're aware of problems with a command, you can usually avoid them without difficulty. It's the unknown bugs that can cause hours of frustration.

If you know of any 64 or 128 bugs, please tell us about them. I'd like to compile a comprehensive list that I can share with other programmers. If you can, explain how to avoid the bug as well as how to create it. If I receive enough information, I'll print the list here, giving credit to all contributing bug-busters who filed their bugs first.

You don't have to limit your bug discoveries to BASIC. If there's a problem with a ROM routine, a disk command, or a compiler that you use, send it in. I'm looking for anything that can help programmers produce clean, error-free code without hassle.

Speaking of Bugs

Sean Ganess wrote in to point out a typo in his "Who's Out There?" tip from the December 1989 "Programmer's Page." When run, this program tells you how many and what types of disk drives are connected to your computer. As listed, however, the program only recognizes up to two drives. To fix the program so it recognizes one, two, three, or more disk drives, change line 40 of the program to read

```
40 DV=DV+1:GOTO 20
```

As before, the drives must have consecutive device numbers (8, 9, 10, and so on) in order for this routine to work.

```
FE 10 DV=8
GK 20 OPEN 15,DV,15:CLOSE 15
KR 30 IF ST THEN DV=DV-1:GOTO
      {SPACE}50
XP 40 DV=DV+1:GOTO 20
GQ 50 FOR T=8 TO DV
EX 60 OPEN 15,T,15
EC 70 PRINT#15,"M-R"CHR$(198)C
      HR$(229)CHR$(1)
FD 80 GET#15,A$:A$=A$+CHR$(0)
GK 90 PRINT "DRIVE";T;"IS A ";
FE 100 IF ASC(A$)=52 THEN PRIN
       T "1541"
GR 110 IF ASC(A$)=55 THEN PRIN
       T "1571"
AM 120 IF ASC(A$)=255 THEN PRI
       NT "1581"
HJ 130 CLOSE 15:NEXT
```

BASIC for beginners

More Lesser-Known Commands

Larry Cotton

Last month we discussed the TAN and ATN functions, but didn't say much about about SIN and COS. Recall that we were trying to find out certain things about triangles. We stated that if we had a *right triangle* (a triangle with a 90-degree angle) and knew any two things about it, we could find out everything else about that triangle.

Look at the figure, which shows a triangle with a 90-degree angle, a 30-degree angle, and a 10-inch side. Knowing this much about the triangle, we can figure out the rest. We begin with the hypotenuse (the long side). Don't forget SOPH, which says that, where X is the angle:

Sine X = OPposite/Hypotenuse

Furnish values and cross-multiply:

SIN 30 × hypotenuse = 10 × 1

Divide both sides by SIN 30:

hypotenuse = 10/(SIN 30)

Here's a simple BASIC program that does the same thing:

```
10 OPP=10
20 RAD=30/(180/π):REM CONVERT
   DEGREES TO RADIANS (SEE LAST
   MONTH)
30 HYP=10/SIN(RAD)
40 PRINT"HYPOTENUSE ="HYP
   "INCHES"
```

The hypotenuse should be 20 inches. To arrive at the third side, we can use the COS function (remember CASH):

Cosine X = Adjacent Side/Hypotenuse

Cross-multiplying:

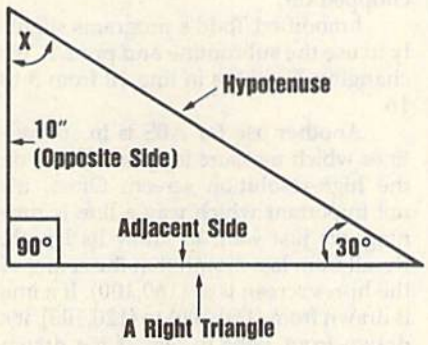
Adjacent = COS 30 × 20

Translated into BASIC:

```
10 HYP=20
20 RAD=30/(180/π)
30 ADJ=HYP*COS(RAD)
40 PRINT"ADJACENT SIDE ="ADJ
   "INCHES"
```

The adjacent side is 17.3205081 inches. To check this, we can use the Pythagorean Theorem (see last month):

```
10 HYP=20:OPP=10
20 ADJ=SQR(HYP↑2-OPP↑2)
30 PRINT"ADJACENT SIDE ="ADJ
   "INCHES"
```



A Right Triangle

We know all three sides and two angles. The third angle can be found using trigonometry, but, as we pointed out in last month's column, there's a much easier way. All triangles share at least one common characteristic: The three angles add up to 180 degrees. Thus, subtracting 90 + 30 from 180 yields 60 degrees. Enough about trig already. Let's move on to the fun stuff—like ABS.

ABSolutely Positive

Who said ABS is fun? Well, at least ABS doesn't stand for *abstruse;* it means ABSolute. ABS gives the absolute value of a number; it leaves positive numbers as they are and changes negative numbers to positive. Its syntax requires parentheses around the number whose absolute value is to be found. Here's a simple example:

```
10 PRINT ABS(32)
20 PRINT ABS(-32)
30 PRINT 73-41
40 PRINT 41-73
50 PRINT ABS(73-41)
60 PRINT ABS(41-73)
```

When you run this program, you should see six 32s; the fourth one will be preceded by a negative sign. Plus signs are not printed in front of positive numbers, but minus signs are printed in front of negative numbers.

(Note also that the 32s without a sign are one space away from the left screen border. This simply indicates that they're positive numbers, not strings. If you typed N$="32":PRINT N$, you would see 32 jammed against the left screen border. It's not really a number when displayed this way. Make it a habit to look for the telltale space between the screen border and the "number." If the space is there, it's actually a number and can be added, subtracted, multiplied, and so on; if not, it's a string.)

Technically, ABS should return a number without any sign. But this little demo shows that it actually yields positive numbers. Enter

```
10 PRINT 32+50
20 PRINT ABS(-32)+50
```

If you run this, you'll see two 82s, indicating that addition was performed between two positive numbers.

So what are some uses for ABS? Here's how to check if numbers are positive:

```
10 X=32:Y=-32
20 IFABS(X)=XTHENPRINT"X IS
   POSITIVE.":GOTO40
30 PRINT"X IS NEGATIVE."
40 IFABS(Y)=YTHENPRINT"Y IS
   POSITIVE.":END
50 PRINT"Y IS NEGATIVE."
```

Crash Prevention

ABS can be used to insure against a program crash should you attempt to take the square root of a negative number, as in this example:

```
10 X=-400
20 PRINT SQR(X)
```

If you run this, you'll get an illegal quantity error in line 20. To avoid this error, study the three-liner below. The value of X can be positive or negative; K will always be positive.

```
10 X=-400
20 K=ABS(X)
30 PRINT SQR(K)
```

Other Uses for ABS

ABS can also be used in a toggle routine. Todd Heimarck, who was an assistant editor of *COMPUTE!'s Gazette*, wrote in the April 1984 issue:

"Let's say you want a variable to switch back and forth between two different values. You could use the following subroutine:

```
10 T=3
20 GOSUB 500:PRINT T:END
499 REM TOGGLE SUBROUTINE
500 IF T=3 THEN T=16: RETURN
510 IF T=16 THEN T=3: RETURN
```

"Each time you want to toggle, you

GOSUB 500. As you can see, T switches back and forth between 3 and 16. But the following routine will do the same thing. . . ." Erase line 510 and change line 500 to

```
500 T=ABS(T-19):RETURN
```

"Line 500 does it all. If T is 3, 3 minus 19 is −16, and the ABS chops off the minus sign. But if T is 16, subtracting 19 yields −3, and the minus sign is chopped off."

I modified Todd's programs slightly to use the subroutine and print T. Try changing T's value in line 10 from 3 to 16.

Another use for ABS is in subroutines which measure lengths of lines on the high-resolution screen. Often, it's not important which way a line is running; we just want to know its length. Recall from last month that the center of the hi-res screen is at (160,100). If a line is drawn from (160,100) to (120,100), it's drawn from right to left. If it's drawn from (160,100) to (180,100), it goes from left to right. Here's how to find this particular line's length, using ABS:

```
10 X1=160:X2=180
20 L=ABS(X1-X2)
30 PRINT L
```

The variables X1 and X2 are the two *x*-coordinates of the ends of the line. Therefore, no matter whether X1 is more or less than X2, you'll always have the correct length L.

More Lesser-Knowns

Let's briefly discuss two more lesser-known BASIC commands this month, SGN and WAIT.

Think of SGN as the opposite of ABS. ABS removes the sign from the number; SGN removes the number but keeps the sign. It doesn't leave just a plus or minus sign hanging around. Rather, it has its own unique way of indicating signs.

SGN's syntax is similar to that of ABS in that the argument (the number) is parenthetical. If you type PRINT SGN(5) or any other positive number, the computer will print 1. If you enter PRINT SGN(−5) or any other negative number, the computer will print −1. And as you may expect, if you type PRINT SGN(0), the computer will print 0.

So how can we use this wonderful information? Let's borrow from Todd again:

```
10 FOR J=1 TO 5:READ K:PRINT K;
20 ON (SGN(K)+2) GOTO 30,40,50
30 PRINT"IS NEGATIVE.":GOTO 60
40 PRINT"IS ZERO.":GOTO 60
50 PRINT"IS POSITIVE."
60 NEXT
500 DATA 15,300,-4,0,-654.32
```

"Line 20 checks the sign of the number. SGN(K) yields −1, 0, or 1. Add 2 to get 1, 2, or 3. The ON-GOTO then makes the program branch to line 30, 40, or 50. It's a quick way to check for positive or negative numbers and branch accordingly." Incidentally, don't confuse SGN and SIN.

WAIT

WAIT is unrelated to any of the lesser-known commands we've discussed in the last couple of months. If you'll consult your *Programmer's Reference Guide*, you'll find that WAIT has been given a lot of attention because it is a difficult command to comprehend. Fortunately, you can also use GET or PEEK in its place. But, let's take a look at it.

WAIT causes a program to be suspended as long as a certain memory location contains a particular value. When that address "sees" another value, program execution is resumed. The new value can come from within the computer, an external device, or—most likely—the keyboard.

The *Commodore 64 Programmer's Reference Guide* states this a little differently: "WAIT . . . causes program execution to be suspended until a given memory address recognizes a specified bit pattern. In other words, WAIT can be used to halt the program until some external event has occurred."

WAIT's syntax is WAIT A,B,C, where A is the memory location to be checked and B and C are so-called *masks*. The variable C and its leading comma may be left out if desired, in which case C is 0.

The most common use for WAIT is to look at the keyboard, as with GET. Enter this short program:

```
10 PRINT"{CLR}{DOWN}PRESS ANY
   KEY."
20 WAIT198,1:POKE198,0:PRINT"PRESS
   ANY KEY AGAIN."
30 GETA$:IFA$=""THEN30
40 PRINT"END OF PROGRAM"
```

Before you run the program, try to guess what it does. Now run it and observe the results. Here's what's happening: Line 10 prints a message. Line 20 WAITs until the contents of memory location 198 is 1. (Memory location 198 on the Commodore 64 contains the number of characters in a special area of the computer's memory called the *keyboard buffer*.) When it contains a 1, we POKE a 0 to 198 to clear it and print the next message.

At line 30, we use the familiar GET statement to wait for a key to be pressed. When none is forthcoming, A$ is a null string, and the program loops at line 30. When a key is pressed, A$ is something other than a null string and control falls through to the next line. Note that you can follow WAIT on the same line with another command, as long as it's not GET. **G**

BEST SHAREWARE FOR C-64 AND C-128

1-800-782-6861

FOR CATALOGUE

Gemini™ Marketing, Incorporated

Circle Reader Service Number 197

Printer Ribbons

Printer	3	6	Qty. 12
Brother M1009, M1109	5.65	4.65	4.15
Citizen 120D, 180D	5.75	4.75	3.99
Commodore MPS 801	4.99	3.99	3.45
Commodore MPS 802/1526	5.99	4.99	4.25
Commodore MPS 803	5.65	4.65	4.15
Commodore MPS 1200/1250	5.75	4.75	3.99
C. Itoh Prowriter Jr.	6.99	5.99	5.45
Epson FX/MX/RX80, FX/LX 800	3.99	2.99	2.40
NEC Pinwriter 2200	6.99	5.99	5.25
Okidata 80/82/83/92/93	2.99	1.99	1.25
Okidata ML 182/183/192	5.25	4.25	3.75
Panasonic K-XP 140/1524/1540	6.99	5.99	5.25
Panasonic K-XP 1080/1090	5.25	4.25	3.75
Seikosha SP 800/1000/1200	5.75	4.75	3.99
Star SG10	2.99	1.99	1.25
Star NX10, NL10	4.99	3.99	3.50
Star NX1000	5.75	4.75	3.99

Quality Diskettes

(Bulk-packed 5.25" DS/DD)

Brand Name	25	50	100
BASF (Black)	.44	.41	.39
KAO (Black)	.45	.42	.40
KAO (Dark Blue)	.49	.45	.42

Other Products

Diskette Holder (Holds 75 disks)	$4.95
Disk Drive Cleaning Kit (12 Cleanings)	$3.25
Disk Notcher (Use both sides of a disk)	$4.95

Order Info:

All orders shipped same or next business day. There is an order processing/packaging charge of $3. Please add an additional shipping charge of $1 per 6 ribbons (or fraction), $1 per 50 diskettes (or fraction), $1 per disk holder, and 25¢ per disk drive cleaner or disk notcher. Orders sent UPS ground (UPS 2nd Day Air and Federal Express available—please call for details).

American Micro Supplies

6473 Crater Lake Hwy.
Central Point, OR 97502

800-678-5576 CG14

Circle Reader Service Number 117

Club Caribe

An Unabashed Tour of an Online Resort

Cold weather got you down? Treat yourself to a getaway at a tropical island resort, with a little help from your 64 or 128 and Q-Link. ▹

Tom Netsel

Club CARIBE

How humiliating! There I was, wandering around wearing my glasses, a dumb grin, and nothing else. Being caught naked in public is the stuff of nightmares, but I was wide awake without even a towel separating me from disgrace.

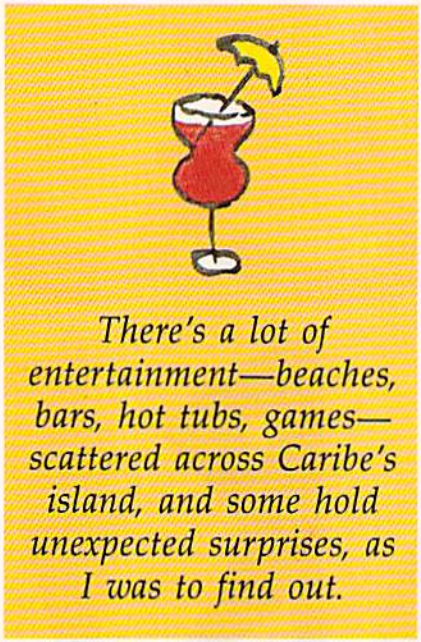
All I wanted to do was check out some of the features offered at Club Caribe, an online animation service created by Lucasfilm Games and Quantum Computer Services. I knew things could get a little zany at Club Caribe, but I didn't expect this. Let me tell you how I got into this predicament in the first place.

Club Caribe is a unique telecommunications experience that's just one of the many features found on QuantumLink, the online service for 64 and 128 owners. A blend of online chatting and interactive cartoon animation, Club Caribe takes you to a simulated vacation resort where you create and control an animated character that embodies real-life actions.

A feature that enjoys enormous popularity on Q-Link is People Connection. This is the area where subscribers from across the country gather to chat "live" via keyboard. Club Caribe takes this concept a step farther with the addition of animation. Now, you no longer are restricted to exchanging text-only messages. As a bonus, Club Caribe adds sound effects and music. The technology for Club Caribe came from *Habitat*, an online multiplayer fantasy-world simulation developed by Lucasfilm Games and Quantum Computer Services. *Habitat* was beta-tested on Q-Link in 1987 and 1988 but is not yet commercially available.

On my first visit to the club, I created this tall, good-looking character who bore a striking resemblance to, well, yours truly. For the fun of it, I added a beard. Select your character's sex, and then choose from a wide range of heads, hair styles, and colors. You'll find more clothing combinations than are stocked in your average mall. After selecting a coordinated outfit that was colorful, but not gaudy, I stepped out on a tour of the club and its entertaining attractions. Little did I know what was in store for me.

Use a joystick to move your character around the screen. Joystick and fire-button combinations allow you to Go, Put, Get, and Do. From the keyboard you can wave, point, hand out, jump, face front or rear, bend, or even frown. Like life, however, Club Caribe is not a perfect environment. If someone rubs you the wrong way and tempers flare, you can throw a punch at another character. Don't expect Mike Tyson's best, though, because punches don't really hurt.

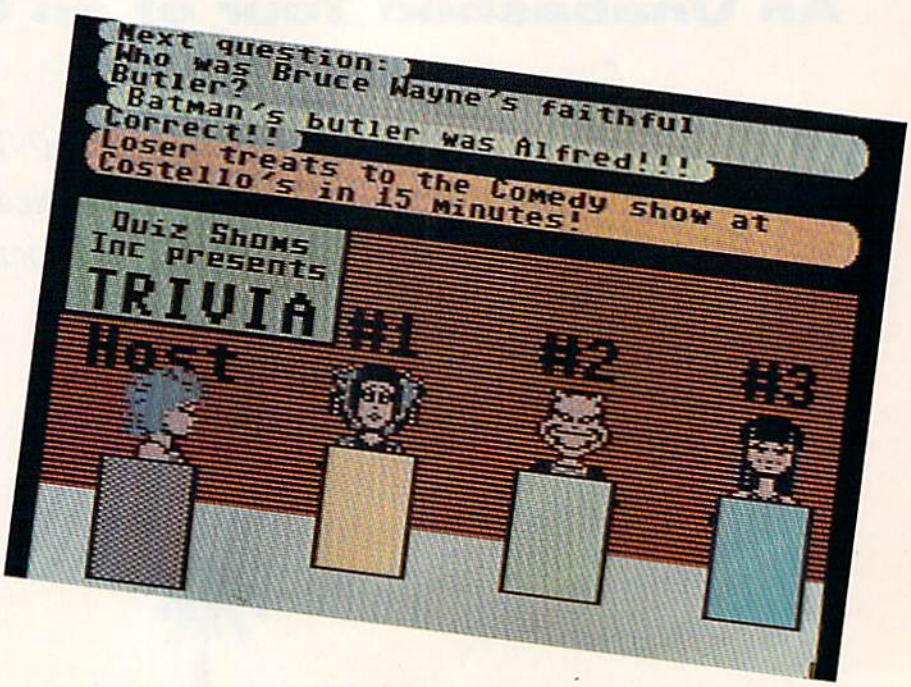


There's a lot of entertainment—beaches, bars, hot tubs, games—scattered across Caribe's island, and some hold unexpected surprises, as I was to find out.

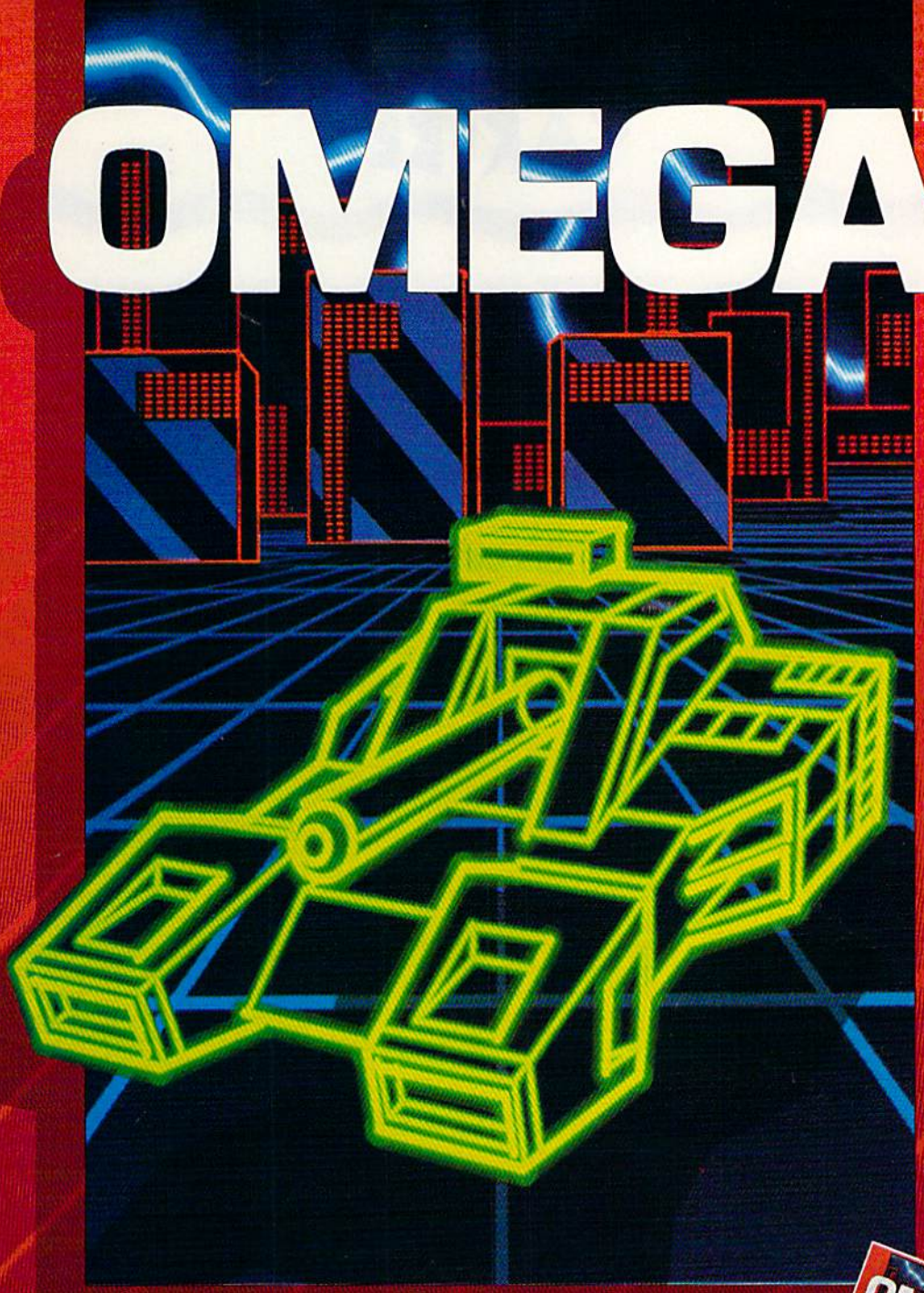
There are plenty of places to visit and explore, but the exciting part is seeing and interacting with other Club Caribe users—or *guests*, as they are called. As you walk along a beach or street, you may see up to five other characters on the same screen. An unlimited number of guests, using Spectator mode, can watch the action but not participate.

Your character can wave to others, walk up to them, and start a conversation just as in real life. Simply type a greeting on the keyboard and press RETURN. The words appear over your character's head in a balloon, similar to those used in comic strips. Balloons are color-coded for each onscreen character, and they scroll up the screen as the conversation progresses.

Other guests may walk by without speaking as they make their way to other areas of the resort. Guests can walk along Club Caribe's beaches, stop in for a drink at Spider's Web, share a hot tub at Cassie's Corner, or play a game of chess, checkers, or



OMEGA™



Neural Cybertank Design and Simulation

Cybertank engineers control the destiny of the Organization for Strategic Intelligence. They're the heart of the **OMEGA** Project, a classified military contract that's shaping combat's future. Employing tomorrow's technology, OSI cybertank engineers design the chassis and artificial intelligence (AI) for the next generation of neural armored warriors—and they gauge their success on a simulated field of battle. Join these elite ranks, and pit your designs against the world's best.

IBM/COMPATIBLE VERSION

IBM/COMPATIBLE VERSION

APPLE VERSION

ORIGIN™

We create worlds.™

Circle Reader Service Number 198

Available for: IBM/Tandy compatibles, C-64/128, Apple II series, Atari ST and Amiga, *coming soon for*, Macintosh and Apple IIgs; actual screens may vary.

*Can't find **OMEGA** at your local retailer?* Call 1-800-999-4939 (8am to 5pm EST) for Visa/MC orders; or mail check or money order (U.S.$) to ORIGIN. All versions **$49.95**, shipping is **FREE** via UPS. Allow 1-2 weeks for delivery. **ORIGIN, P.O. Box 161750, Austin, Texas 78716.**

backgammon in the arcade. There are numerous entertaining regions scattered across Club Caribe's island, and some contain unexpected surprises, as I was to find out.

Going from one region to another is similar to walking around a resort. Simply direct your character to the edge of a screen and it walks to the next area. Characters and scenery come from data on your Club Caribe disk, and commands to move the characters arrive via your modem. For speedier transportation to different parts of the island, try the teleport. Take a token from your pocket (you can carry up to five objects at a time, but buy a box or bag if you're the type who collects things) and put it into the teleport. When the booth starts to flash, type in your destination. Before you can say, "Beam me up, Scotty," you're there.

Teleports are popular and make ideal places to meet members of the opposite sex. Most guests are very friendly and are glad to stop and chat for a while, answer questions, or offer help. For longer conversations, pull up a chair or barstool at Kelly's Pub or one of the island's other watering holes. If your conversations require privacy or if you want to chat with a guest in another region, use Club Caribe's ESP service. Electronic mail is another club feature.

If two characters really hit it off, Club Caribe provides a chapel at the end of the island near Lover's Point. Marriages are performed there three days a week.

If two characters really hit it off, Club Caribe provides a chapel at the end of the island near Lover's Point. Marriages are performed there three days a week. I'm not sure how binding these marriages are, but what better place than Club Caribe for a honeymoon?

Regardless of your marital status, feel free to take in a show, tour the aquarium, try on costumes at the theater, or attend any of the resort's special events. The staff arranges tours for newcomers, spelunking in sea caves, games of Simon Says, treasure hunts, trivia contests, and other multiplayer activities.

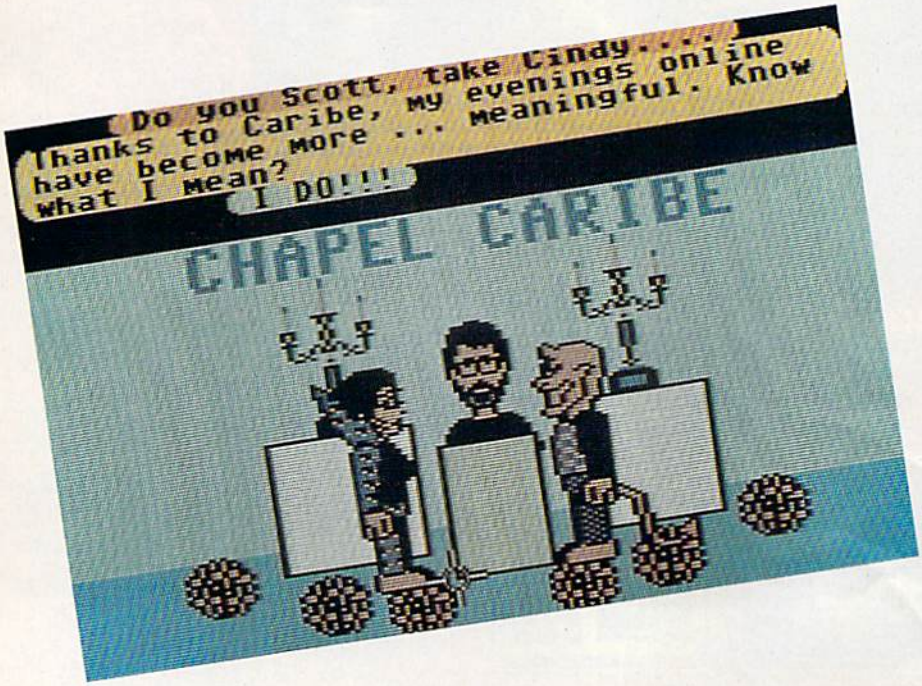
But Club Caribe is not all roses and moonbeams. Despite the staff's best efforts to ensure that guests have an enjoyable stay, unpleasantries can occur. My being left to wander around in the nude is one example. And then there's that warning I spotted in the sewer.

I was behind the club's shops one evening when I spotted an open manhole. Being curious, I decided to poke my nose into what goes on beneath the resort. After I climbed down a ladder, I noticed a sign posted on the sewer wall. It was a warning about getting lost in the sewer's meandering tunnels—lost so soundly that even the Club Caribe staff might not be able to help. There was also something about the area being inhabited by thieves, and if I ventured farther there was a good chance I'd be robbed.

I'm curious, yes, but no fool. I decided to skip the sewers until another day. Besides, I'd already seen examples of above-ground thievery. On more than one occasion, I'd seen unfortunate guests strolling around without their heads. Some may scoff at this notion, but it's true. Ask Razzman or Rebel Rat, two headless characters I encountered one evening.

Razzman had fallen victim to a reprehensible head-snatcher, while Rebel Rat's affliction was self-induced. He had hocked his head at a pawn shop. I'm not sure what he did with the money, but he seemed quite happy sometime later when I found him trying on theatrical heads backstage at a local theater. When he asked me what I thought of his new head, I told him he looked great. I lied. It was inferior to his original creation, but I hated to hurt his feelings.

At Club Caribe, guests have the curious ability to take off their heads. ▷


Do you Scott, take Cindy....
Thanks to Caribe, my evenings online have become more ... meaningful. Know what I mean?
I DO!!!
CHAPEL CARIBE

Great Games

Sale Prices!

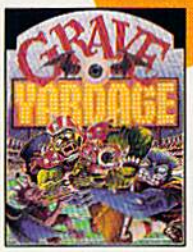
SAVE $$$

C64/128
~~$30.95~~
Sale $27.95
BY-1229

Battletech-Infocom
Animated role-playing adventure with exciting battle action. Detailed story, setting with over 4 million locations.

C64/128
~~$29.95~~
Sale $22.95
BY-2323

Ghostbusters II-Activision
Relive the hit film—sample slime, pilot Miss Liberty, battle Vigo. Arcade action, adventure, strategy challenge—and laughs!

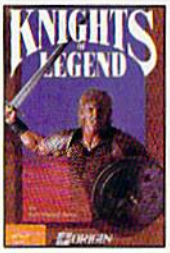


C64/128
~~$29.95~~
Sale $22.95
BY-2141

Grave Yardage-Activision
Zombies, ogres, and goblins on the gridiron. Real football action that's—well, unreal. Everything is legal, and the ball is alive . . .

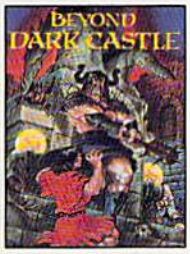
C64/128
~~$44.95~~
Sale $29.95
BY-2215

Dragon Wars-Interplay
Ultimate role-playing fantasy. Great story, over 120 monsters and spells, auto-mapping. Supports characters from *Bard's Tale I, II, III.*



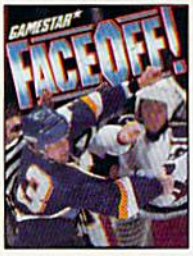
C64/128
~~$49.95~~
Sale $34.95
BY-2155

Knights of Legend-Origin
Over 70 locales and 100's of characters in medieval fantasy role-playing. Compelling drama, comprehensive combat system.



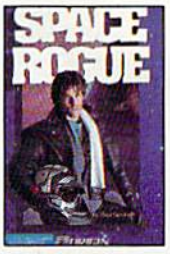
C64/128
~~$29.95~~
Sale $22.95
BY-1983

Beyond Dark Castle-Activision
Best arcade/strategy challenge. 14 full-scrolling mazes, multiple skill levels, great graphics, an evil Black Knight—and a touch of humor!



C64/128
~~$29.95~~
Sale $22.95
BY-2145

FaceOff!-Gamestar
Furious shoot-'n-fight hockey action. ShotCam and FightCam put you on goal and in the brawls. Playmaking, GM functions, league play.



C64/128
~~$49.95~~
Sale $34.95
BY-2152

Space Rogue-Origin
3-D flight simulation and intriguing role-playing escapades. Seek your fortune, face alien foes, solve the mysteries of deep space.

Any 3 for $29.85 • Any 6 for $49.75

VISA, Master Card and American Express accepted.

To order, call toll-free 1-800-227-6900.

Activision	
Hacker	BY-LAAH
Hacker II	BY-LAAA
Shanghai	BY-LAAB
Air Rally	BY-LABM
Tass Times	BY-LAAC
Murder on the Mississippi	BY-LAAF
Borrowed Time	BY-LAAK
Mindshadow	BY-1008
Ocean Ranger	BY-1714
Transformers	BY-LAAW
Data East	
Tag Team Wrestling	BY-1004
Gamestar	
Championship Basketball	BY-LEAB
Baseball/Football	BY-1807
Infocom	
Zork II	BY-1526
Hollywood Hijinx	BY-1372
Moonmist	BY-1514
Plundered Hearts	BY-1333
Ballyhoo	BY-1408
Cutthroats	BY-1392
Deadline	BY-1424
Witness	BY-1498
Zork I	BY-1490
Lane Mastadon	BY-1301
Gamma Force	BY-1304
Taito	
Alcon	BY-2324

Call for your free catalog.

All games shown are for Commodore 64 and 128. Please call for availability on other systems.

TRITON PRODUCTS COMPANY

Circle Reader Service Number 188

Club Caribe

You can carry them or put them on a table, just as you can any other object. Leave them unguarded, however, and some unscrupulous churl may make off with them. That's what happened to Razzman. I wonder if he ever got it back.

I suspect something like that happened to my clothes, which brings me to my own misfortune. While exploring the island, I happened to notice signs pointing to a nude beach. I didn't go because I wanted to, of course; I simply felt it was my journalistic duty to uncover as much as I could about this online resort.

As I followed the path to the beach, my clothing suddenly disappeared and I found myself in my birthday suit. Don't get too excited, though. Remember, these are cartoon-like characters, and I doubt that their nudity will arouse anyone's prurient interest.

I won't bore you with details of the beach—it's the usual sun, sand, and skin. If you've seen one nude beach, you've seen them all. When I left the beach, I fully expected my clothes to reappear just as they had vanished, but nothing happened. By the time I walked a few screens farther from the beach, I realized I was stuck in the buff.

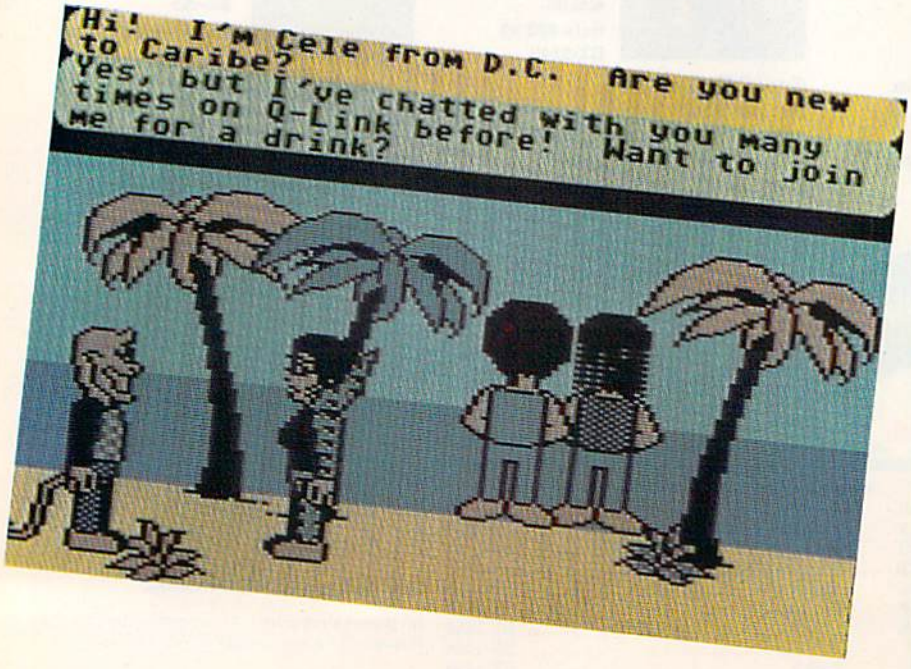
I saw signs for a nude beach. I felt it was my journalistic duty to uncover as much as I could about this online resort.

Fig leaves don't grow on trees at Club Caribe, and I needed more than a smile to hide behind. Swallowing my pride, I made my way to a nearby Club Caribe Help Desk, one of several scattered conveniently about the resort. Naturally, it was crowded, and I attracted some attention. Some clown shrieked, "Look, a naked bearded lady!" Dignity won over violence, however, and I refrained from punching his lights out.

The friendly Club Caribe guide guessed what had happened and reminded me that I could get new duds—and even a new head—at a shop called La Vous New. But for now I could use a portable paint sprayer she carried with her in a box. Not wishing to waste time trying to find a tasteful color scheme, I took the first blast of paint the sprayer offered. Maybe I should have been more choosy.

Many outfits at Club Caribe tend to be of the striped or checked variety and are somewhat gaudy—but have you ever seen a brick suit? I now blend in with the buildings.

Rumor has it that my clothes would have been returned when I left the beach if I'd come and gone on the same path. Come to think of it, I did leave by a different route. Maybe if I stroll along the beach again I can work out a trade. If that doesn't work, I'd better plan on buying a new outfit. I think I have enough tokens for a new paint job, but if not, I can always hock my head. **G**



Membership Information

To visit Club Caribe you must be a Q-Link member and have a 64 or 128, a 1541 or 1571 disk drive, a modem, and the Club Caribe disk. The disk costs $7.95 and may be ordered online. From Q-Link's main menu, select Just for Fun. Continuing through the menus, from Arts and Entertainment/Club Caribe, go to the Club Caribe Travel Guide and then to Order the Club Caribe Software.

There is no membership fee to join Q-Link and to receive its Starter Kit, including a disk, connect guide, and new member's guide. Members are charged a flat fee of $9.95 a month for Q-Link's Basic services, ranging from news and weather to stock quotes and online shopping. Plus services, such as People Connection and Club Caribe, cost eight cents per minute. Q-Link is available weekdays from 6:00 p.m. to 7:00 a.m., local time, and 24 hours a day on weekends.

For further membership information or to join, call QuantumLink toll-free at (800) 782-2278 between noon and 1:00 a.m. EST or write to Q-Link, 8619 Westwood Center Drive, Vienna, Virginia 22182.

How to build a high-paying career, even a business of your own, in computer programming.

CARL BARONE,
NRI PROGRAMMER/ANALYST

Start with training that gives you hands-on programming experience—at home and at your own pace. Training that begins with BASIC, then continues with Pascal, C, and COBOL—today's hottest computer languages. Training that even includes a powerful IBM-compatible computer, modem, and programming software you keep.

Start with real-world training. The kind of training only NRI provides.

Now with NRI's new at-home training in Computer Programming, you can be one of today's highly paid, creative team of computer wizards who give computers the power to carry out an astonishing range of business, professional, and personal applications. Now, with NRI, you can be a computer programmer, ready to build a high-paying career—even a business of your own—making computers do anything you want them to do.

The only programming course that includes a powerful computer system and software you keep.

Unlike any other school, NRI gives you hands-on programming experience with a powerful IBM-compatible Packard Bell computer system, including 2400 baud internal modem, 512K RAM, disk drive, monitor, and invaluable programming software—BASIC, Pascal, C, and COBOL—all yours to keep.

You get the experience and the know-how, the computer and the software to get to the heart of *every* programming problem, design imaginative solutions, then use your choice of four key computer languages to build original, working programs.

No matter what your background, NRI gives you everything you need to succeed in programming, today's top-growth computer career field.

You need no previous experience to build a successful programming career with NRI training. Indeed, your NRI lessons start by walking you step by step through the fundamentals, giving you an expert understanding of the programming design techniques used every day by successful micro and mainframe programmers. And then the fun really begins.

With your personal NRI instructor on call and ready to help, you use your computer and software to actually design, code, run, debug, and document programs in BASIC, Pascal, C, and COBOL. Then, rounding out your training, you use your modem to "talk" to your instructor, meet other NRI students, even download programs through NRI's exclusive programmers network, PRONET.

Your career in computer programming begins with your FREE catalog from NRI.

For all the details about NRI's at-home training in Computer Programming, send the coupon today. Soon you'll receive NRI's fascinating, information-packed, full-color catalog.

Open it up and you'll find vivid descriptions of every aspect of your NRI training. You'll see the computer system included in your course up close in a special, poster-sized foldout section. And, best of all, you'll find out how your NRI training will make it easy for you to build that high-paying career—even a business of your own—in computer programming.

You master today's hottest computer languages, gaining the skills you need to build programs for a wide variety of real-world applications.

Send for your NRI catalog today. It's yours, free.

If the coupon is missing, write to us at the NRI School of Computer Programming, McGraw-Hill Continuing Education Center, 4401 Connecticut Avenue, NW, Washington, DC 20008.

IBM is a Registered Trademark of the IBM Corporation

Only NRI gives you an IBM-compatible computer with modem, 512K RAM, disk drive, monitor, and software—BASIC, Pascal, C, and COBOL—all yours to keep!

NRI School of Computer Programming
McGraw-Hill Continuing Education Center
4401 Connecticut Avenue, NW
Washington, DC 20008

YES! Please rush me my FREE catalog describing NRI's at-home training in Computer Programming.

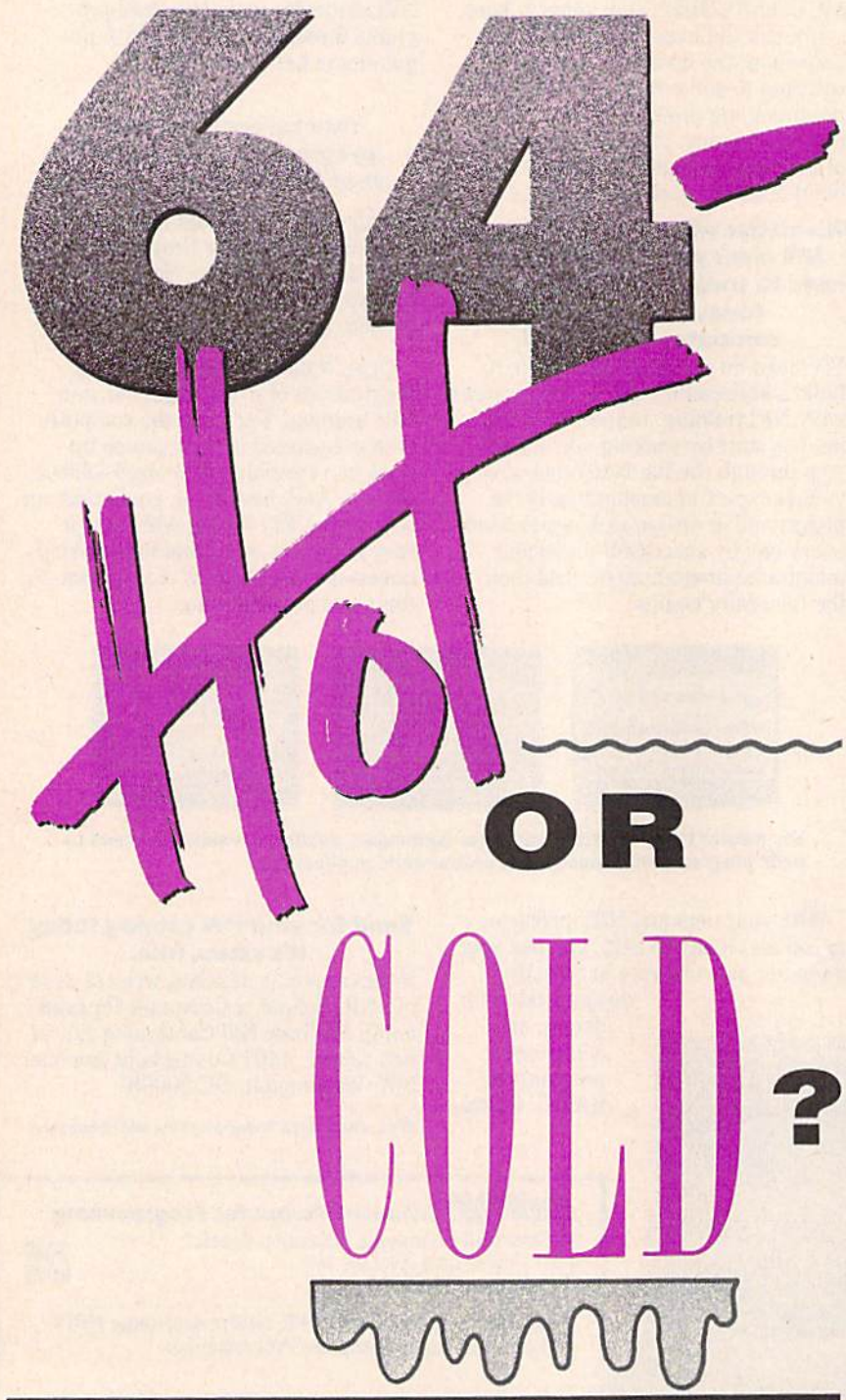
NAME (please print) AGE

ADDRESS

CITY/STATE/ZIP

Accredited by the National Home Study Council 5404-020

THE 64 — Hot OR COLD?



Tom Netsel

Kevin Perdue put his 64 to work in a big way—and business is heating up fast.

Think of a 64 on the job and you'll probably picture it doing work in a white-collar office. But some 64s have blue-collar skills. In the suburbs of the nation's capital, about 100 of these machines work in boiler rooms, controlling the heating and cooling requirements of apartment buildings and complexes.

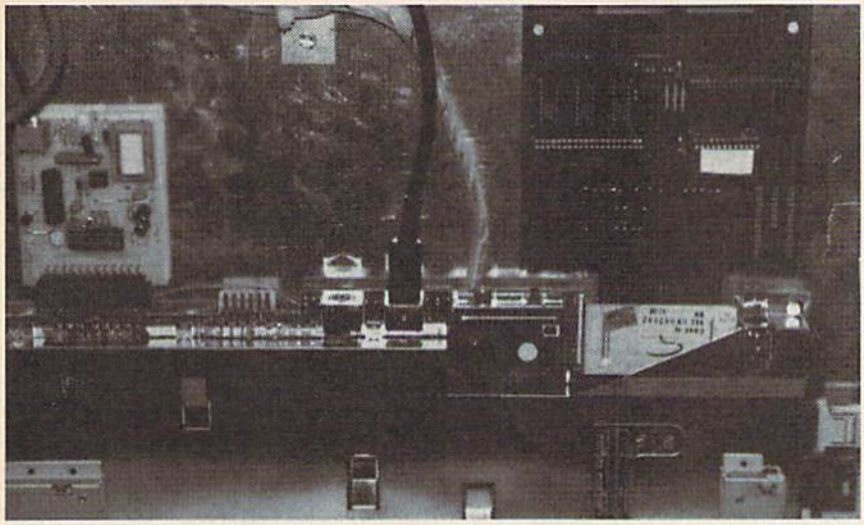
Kevin Perdue, president of HVAC Concepts in Rockville, Maryland, has built a heating, ventilation, and air conditioning business around the 64, and he uses the 8-bit workhorse as the heart of a rather sophisticated energy-management system.

"In every garden-style apartment project in this area, there is a boiler of some sort," Perdue says. "It makes the hot water that's used for heating and the domestic hot water that's used for dishwashers and showers."

A device called a *chiller* makes cold water just like a boiler makes hot water. "They are the monsters that eat the kilowatts and cost big bucks to run," Perdue says. At the appropriate outdoor temperature, the computer starts these machines and regulates them to keep the tenant cool and comfortable without wasting energy and dollars.

Pumps need to be turned on and off at the proper time, and valves must be positioned properly for the process to work smoothly. Monitoring and controlling these items is vitally important to the successful management of an apartment complex. Managers must keep tenants comfortable, but they also have to keep an eye on heating and cooling costs.

Computers are the most accurate and effective means for controlling such systems, but they can be expensive. A large energy-management system can cost $30,000, but Perdue has found a way to do the job for a fraction of that cost using a 64. In order to manage such a heating system, the computer first has to start several pumps, then make some minute adjustments. "These are fairly big pumps," Perdue says, "about the size of your desk."



The heart of Kevin Perdue's KPS-16 is a Commodore 64 motherboard. Alterations include a new power supply, a modem (on the left), and an EPROM board (right).

At first Perdue was not sure a 64 was up to the job, but about five years ago, he put a 64 in a boiler room just to see what it could do. He was working with his partner at Noyes Air Conditioning, HVAC Concept's parent company, and they had to talk a management firm into letting them try the experiment.

"The first one went in for Kay Management in 1984, and during the course of that summer it saved $18,000," Purdue said. "The building manager saw the savings and wanted computers in all his buildings."

Perdue was as surprised as anyone at how well the 64 performed. "We were just goofing around and playing with it. Our first question was how long a 64 would last in a boiler room environment, but it just keeps on ticking." In order to get more data, Perdue installed computers in four additional complexes and achieved similar savings with all of them.

The following year, after changing the power supply and installing a backup battery, Perdue installed 22 computers and HVAC Concepts became a growing concern. Now there are about 100 installed units in the Maryland, Virginia, and Washington, D.C., area.

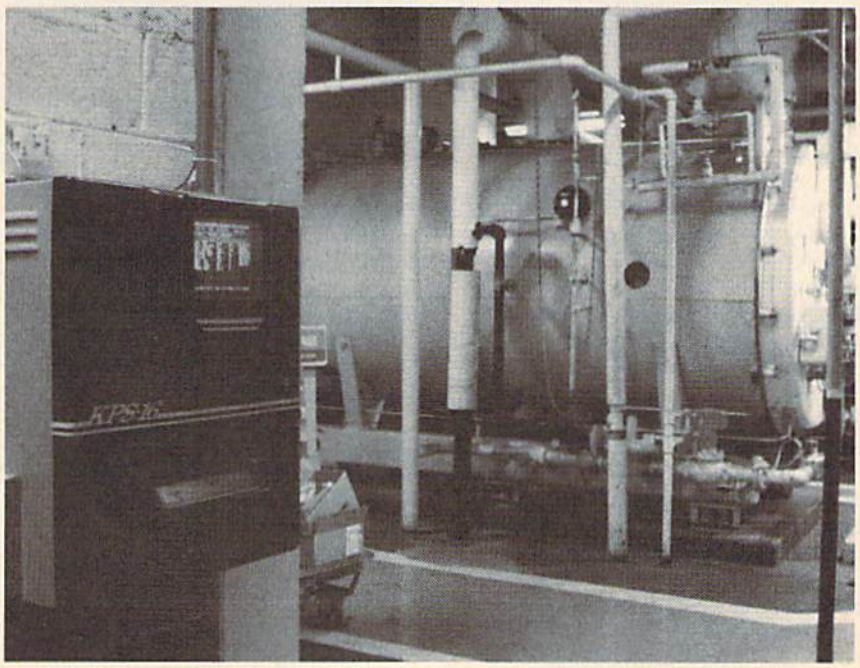
The 64's interior is modified only slightly, but the exterior bears little resemblance to units found in most homes. Perdue does not use the case or keyboard, so he buys only the motherboard (now in its E version) from Commodore. He connects a modem and plugs in an EPROM board. Sensors, control valves, thermostats, and other devices in a boiler room are connected to the 64 via input/output terminals on a board plugged into the 64's expansion port. A small monitor plus a couple of master switches are then added to the package, which is housed in a metal box. There is no disk drive—software is downloaded via modem. Perdue calls his unit the KPS-16. In its sturdy metal box, one could almost think of it as a 64 in a hard hat.

"On a newly installed unit, a program in the EPROM starts an autodial program that calls either a 128 or an IBM from our monitoring center," Perdue explains. "It identifies itself with its serial number and location and requests a download. We insert a disk into the 128 or IBM drive, send it its program, and tell it to run."

The program, customized to control the equipment at each site, can easily be monitored at HVAC headquarters. "We have burst communications that is encoded for speed," Perdue says, "and we can look at all the temperatures, see what's running and what's not running, and make any changes." There are 100 setpoints in a system, and all are easily controlled, monitored, or adjusted from the remote computer. "With just two keystrokes, we can turn a 600-ton chiller on or off or adjust it from 44 to 42 degrees."

In addition to handling the operating chores, Perdue's 64s maintain records for analysis. About once every two hours, the monitor system automatically calls each computer, logs on, and downloads all current information about which units have been on, their

A large energy-management system can cost $30,000, but Perdue found a way to do the job using a 64.



The KPS-16 controls a large apartment building's heating and cooling requirements.

temperatures, and any problems experienced.

For example, a small apartment project may have four water heaters set for 130 degrees. The computer keeps a log of how many times the heaters start and how long each one stays on. Suppose the manager and site engineer have the computer set the temperature for 135 degrees for certain hours during the day and then cut it back to 122 degrees at night. The system runs with those settings for a week and then the total number of run-hours for the heaters is examined.

For that week, the heaters may have run for 100 hours. The next week, with a couple of keystrokes, the manager or engineer decides to change the temperature during the day from 135 to 132 degrees, and perhaps adjust the time that the night temperature kicks in. At the end of the week, they'll look at the report and see that the heaters ran 97 hours. "That saved them three hours of run time at 300,000 Btu, which is 300 therms," Perdue says. "A therm costs 61 cents, so they saved $180 that week by making that setpoint change."

Before the monitoring system was installed, managers never had access to this type of information. An engineer could make adjustments, but management never really knew how effective any change was.

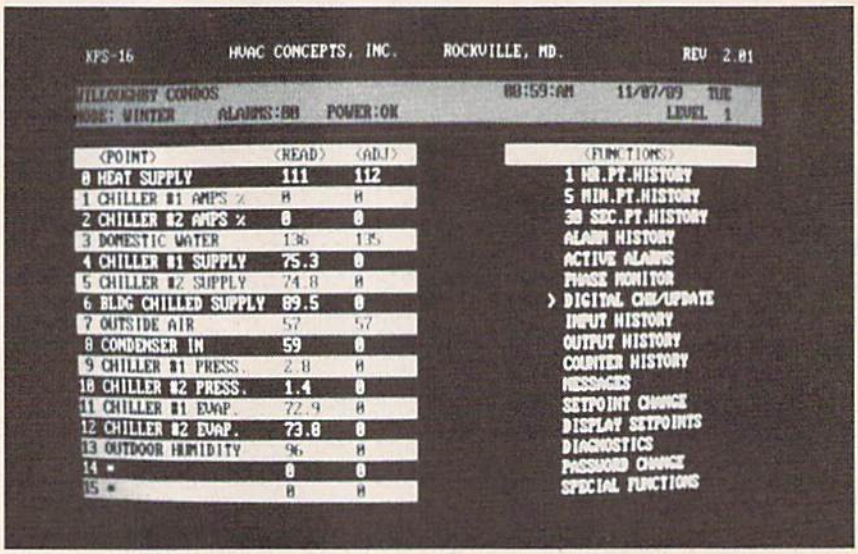
If a problem develops at a site—a temperature goes too high, a pump fails, a boiler flames out, a chiller won't start—the 64 calls the monitoring center at HVAC Concepts, displays an alarm message, and identifies the problem.

"At that point, our monitors get on the horn and contact the engineer or dispatch a service truck to combat the problem," Perdue says. "And 90 percent of the time, we'll know about the problem and have it fixed before the tenants are discomforted." That's a big benefit for management companies.

Perdue worked with Micro World Electronix in Lakewood, Colorado, which came up with a board that plugs into the 64's expansion port to provide input and output terminals. This MW 611 board is modified to provide a 16-channel analog-to-digital conversion, a peripheral interface adapter—similar to what reads the keyboard in a 64—and 16 discreet outputs used to turn devices on and off.

In the event of a power disturbance, a two-part EPROM on the board immediately shuts equipment down to prevent damage and then waits for the power to be restored. If power is off for an hour, the 64 calls the monitoring center and notifies personnel of the power outage. The battery backup maintains the program and restarts the equipment when power is restored. If the power is off for more than eight hours, the onboard batteries fail; then the computer essentially is shut off.

When power returns, the 64 reads the EPROM and automatically calls the monitor center, asking for its software. It downloads a 15K–20K program in about eight minutes and reboots the system. Should lightning strike nearby or some other disturbance cause the program to crash, a built-in watchdog program detects the problem, reboots the machine, and downloads a fresh program.



Customized software for each building is downloaded from a Commodore 128 at HVAC Concepts office. Temperatures of hot and cold water and dozens of other boiler-room functions can be monitored and adjusted from a remote computer.

An apartment complex with more than 1000 units is controlled by one of Perdue's modified 64s.

The other half of the EPROM program is a wedge that Perdue wrote to add command words to the 64's 2.0 operating system. These commands are used for turning devices on and off, answering its telephone, and storing equipment histories. These are commands common to each site. By having them built into the operating system, they don't have to be downloaded each time.

As oil, gas, and electricity rates increase, energy-management systems in commercial applications become more popular. Most systems on the market are designed for large buildings, but to put one of them in a small boiler room would be overkill. With a 64 at the heart of Perdue's system, his units can handle similar chores in smaller boiler rooms and do it at a more than reasonable price.

The system is not limited to small buildings, however. Perdue says the largest apartment complex in his area, with more than 1000 apartments, is controlled by one of his modified 64s. Not bad for an 8-bit computer. So, the next time you visit a boiler room, take a look at its control unit and you may spot an old friend: a 64 wearing a hard hat. **G**

Kevin Perdue would like to hear from anyone using a 64 for building automation. Contact him at HVAC Concepts, 5451 Randolph Road, Rockville, Maryland 20852; (301) 468-6454. Author Tom Netsel is also interested in hearing from readers who put their 64s or 128s to interesting uses. He can be reached at COMPUTE! Publications, 324 West Wendover Avenue, Greensboro, North Carolina 27408.

ESTABLISHED 1968

MONTGOMERY GRANT

GAZZETTE 2.90

OUTSIDE USA & CANADA..CALL
(718)692-0790
FOR CUSTOMER SERVICE
Call:Mon-Wed 9:30-5,
Thurs 9:30-7, Fri. 9am-3:30pm
(718)692-1148

Retail Outlet: Penn Station, Main Concourse
(Beneath Madison Square Garden) NYC, NY 10001
Store Hours: Mon-Thurs 8:30-8/Fri 8:30-3:00/Sat-Closed/Sun 9:30-7
FOR ORDERS & INFORMATION IN USA & CANADA
1-800-759-6565

OR WRITE TO:
Montgomery Grant Mail Order
Department. P.O. Box 58
Brooklyn, NY 11230
FAX NO. 7186923372
TELEX 422132 MGRANT

Order Hours: Mon-Thurs, 9:00am-7pm / Fri, 9:00am-4:00pm / Sat-Closed / Sun, 9:30am-6:00pm
NO SURCHARGE FOR CREDIT CARD ORDERS WE INVITE CORPORATE & EDUCATIONAL CUSTOMERS
DISCOUNTS FOR QUANTITY ORDERS / RUSH SERVICE AVAILABLE / TOLL FREE TECHNICAL SUPPORT

AMIGA

AMIGA 500

- Amiga 500 w/512K • Built-in 3.5" Disk Drive • Mouse • FREE Software

$549

AMIGA 500
RGB COLOR PACKAGE

- Amiga 500 w/512K • Built-in 3.5" Disk Drive • Mouse • RGB Color Monitor • Free Software

$749

AMIGA 500 With 1084.....$829
AMIGA 500 With 1084 & 1010 3.5" Drive.....$999

PERIPHERALS

AMIGA 1010 Disk Drive..$179
A-1680 Modem.....$99.95
20, 30, 40, 60, 80MB Hard Drives for AMIGA 500/2000.....IN STOCK
A-2088D Bridge Card.....$499
A-2286D Bridge Board.....$1149
A-501 Memory Expansion.....$149
A-1084 RGB Color Monitor.....$289
AMIGA A-2058 RAM Expansion.....$699
ALL OTHER AMIGA PERIPHERALS & HARD DRIVES IN STOCK

C= 64C commodore C= 128= D

$119.95
INCLUDES:
FREE GAME ($19.95 VALUE)
GEOS PROGRAM
QUANTUM LINK SOFTWARE & MEMBERSHIP

C-128D with Built-In Disk Drive
$429

COMMODORE C 64-C
STARTER PACKAGE

- C/64-C with Excelerator Plus
- Disk Drive • Two Games Softwares
- GEOS Program
- Quantum Link Software & Membership
- FREE Gift Offer

$229

COMMODORE C 64-C
COMPLETE PACKAGE

- Commodore C-64/C Computer
- Commodore 1541-C Disk Drive
- Commodore Color Printer
- 12" Monitor • GEOS Program
- Quantum Link Software & Membership

$319

COMMODORE C 64-C
COLOR PACKAGE

- Commodore C-64/C Computer
- Commodore 1541-C Disk Drive
- Commodore Color Printer
- Color Monitor • GEOS Program
- Quantum Link Software & Membership

$429

SEAGATE
20, 30, 40, 60, 80, 100MB
HARD DRIVES IN STOCK

1571 Disk Drive
CALL

1581 Disk Drive
CALL

1541II Disk Drive
Includes Free Game! (a $19.95 Value)
$159.95

Excelerator Plus FSD-2 Disk Drive
Includes Free Game! (a $19.95 Value)
$129.95

1750 RAM Expansion
CALL

1084 Monitor
$289.95

1802 Monitor
$189.95

COMMODORE 128D
COMPLETE PACKAGE

- Commodore C/128-D Computer with Built-in Disk Drive
- Commodore Color Printer
- 12" Monitor

$479

COMMODORE 128D
DELUXE PACKAGE

- Commodore C/128-D Computer with Built-in Disk Drive
- Commodore 1902 RGB Color Monitor
- Commodore Color Printer

$629

C/128-D Complete w/1084 Monitor **$699**

1700 RAM Expansion	$99.95
#1764 Expansion Module	$114.95
XETEC S. Graphix Jr. Interface	$29.95
XETEC S. Graphix Sr. Interface	$49.95
XETEC Supergraphix Gold	$74.95
C-64/C -64C Power Supply	$29.95
C-1660 Modem	$19.95
C-1670 Modem	$59.95
COMMODORE 1350 Mouse	$26.95
XETEC Lt. Kernal 20MB Hard Drives for:	
C-64C	$799
C-128 & 128D	$849
XETEC 40MB Hard Drive for:	
C-64/128 &128D	$1199

WE CAN RECONFIGURE ANY OF OUR COMPUTER PACKAGES TO YOUR SPECIFICATIONS.
CALL FOR INFORMATION.

COMMODORE COLT

MONITOR INCLUDED

- COMMODORE COLT Computer • 640K • 4.77-7.16MHz • 2.360K Floppy Disk Drives • Mono Monitor • MS DOS & GW Basic

$659

w/1 Floppy & 20MB Hard Drive.....$859
COMMODORE COLT w/1084 MONITOR.....$869

COMMODORE PC-40III

$1599

- IBM AT COMPATIBLE • 80286/12MHz • 1MB RAM • 40MB Hard Drive • 1.2MB Floppy • Video Graphics Card • 12" VGA Monitor • MS DOS 3.3 • GW Basic

PRINTERS

HEWLETT PACKARD

HP Deskjet	$569.95
HP Deskjet Plus	$669.95

EPSON

LX-810	$179.95	LQ-510	$329.95
FX-850			$329.95

STAR

NX-1000			$154.95
NX-1000C			$159.95
NX-1000II			$164.95
NX-1000 Rainbow			$209.95
NX-1000C Rainbow			$209.95
NX-2400			$277.95
XR-1000	$319	XR-1500	$409
XB-2410			$409

NEC

P5200	$479.95

OKIDATA

OKIMATE 20	$139.95	320	$279.95
OKIDATA 180	$219.95	390	$439.95
		321	$439.95

Panasonic

KXP-1180	$168	KXP-3131	$269
KXP-1191	$224	KXP-1124	$289
KXP-1092L	$269	KXP-1524	$519

commodore

MPS-1250	$219

Panasonic FX-1650
IBM XT COMPATIBLE PACKAGE

- 640K • 720k Floppy Drive • Parallel/Serial Ports • MS DOS 3.3 • GW Basic • 12" Monitor • Word Processing, Database & Spreadsheet Software

$499

SAME w/SEAGATE 20MB.....$749
30, 40MB PACKAGES.....CALL

AMIGA 2500

- 3MB RAM • Keyboard • Mouse
- Built-in 3.5" Disk Drive • 40MB Hard Drive • System Software • Amiga Basic

$3199

AMIGA AMIGA 2000

- A-2000 Computer w/Keyboard
- 1MB Expandable to 9MB
- Built-in 3.5" Disk Drive • Mouse
- FREE Software

$1459

AMIGA 2000 w/1084 Monitor.....$1739
AMIGA 2000HD.....$2099

AMIGA AMIGA 2000
RGB COLOR PACKAGE

- A-2000 Computer w/Keyboard • 3.5" Disk Drive
- RGB Color Monitor • Free Mouse & Software

$1659

AMIGA 2000 w/SEAGATE 40MB H.D...$1949

EPSON EQUITY II+
IBM AT COMPATIBLE

- Keyboard • 640K RAM • 80286 Microprocessor • 1.2MB Floppy Drive • 12" Monitor • MS DOS 3.3 & GW Basic • Wordprocessing, Database & Spreadsheet Software

$969

SAME WITH SEAGATE 20MB HARD DRIVE....$1189
SAME WITH SEAGATE 30MB HARD DRIVE..$1229
SAME WITH SEAGATE 40MB HARD DRIVE..$1289

Certified Check, Bank Check, Money Orders, Approved PO's, Mastercard, Visa, Amex, Diner's Club, Carte Blanche, C.O.D.'s accepted. Please call before submitting P.O.'s. No additional surcharge for credit card orders. Non-certified checks must wait 4-6 weeks for clearance. N.Y. residents add applicable sales tax. Prices and availability subject to change without notice. Not responsible for typographical errors. Return of defective merchandise must have prior return authorization number or returns will not be accepted. IBM XT AT are registered trademarks of International Business Machines Corp. Please add 5% shipping & handling (min. $6). Volume orders over $2000 are discounted to 3% shipping & handling. Canadian orders add an additional 5%. APO FPO orders please add 10% shipping & handling. All APO FPO are shipped first class priority air. All orders can be shipped Air Express. Call for details. D.C.A. #800233

Future Computing

Neural Networks

Part 2

Kevin E. Martin

In this month's installment, we'll look at some programs you can use to begin to understand this exciting branch of neural networks.

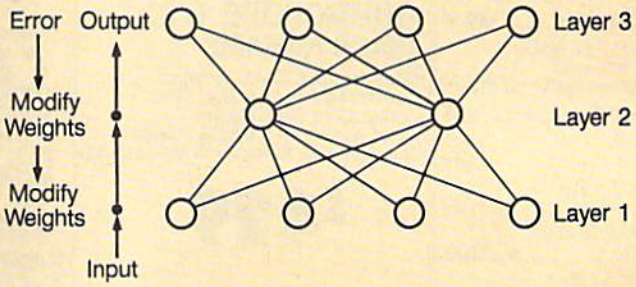
Last month we introduced the topic of neural networks with a general discussion, and we took a closeup look at the linear associator (LA) neural network. The LA is able to learn to associate different input and output patterns, but there are limitations. Only certain input patterns are learnable.

The number of input patterns the LA can learn is equal to the number of processing elements (PEs) in the first layer of the network. For example, take a network that contains ten PEs in the first layer. You can present 1024 different patterns to the input layer, but the network can learn only 10 of them exactly. If you try to force the network to learn more, the patterns it previously learned will become contaminated.

This limitation makes the back propagation (BP) neural network a better choice for practical applications. In fact, back propagation is the most commonly used neural network architecture used in the business world today. To get you started in your explorations of neural networks, I've included a machine language program with an interface to BASIC. The program, *BP*, implements the back propagation algorithm. Also listed are two examples to illustrate the power of this algorithm.

To overcome the limitations of the linear associator, back propagation introduces another layer in the middle of the network (see Figure 1). The middle layer allows the network to develop an internal representation of the problem it is assigned to solve. This internal representation is developed entirely within the network. As you can see in Figure 1, layer 2 receives input from layer 1 and outputs its results to layer 3. This means that it doesn't receive any inputs or outputs directly from the outside world, and therefore a learning algorithm that can develop this internal representation is required. The internal representation codifies the inputs into many different features. These features will be discussed in greater depth in the exclusive-OR example below.

Figure 1



The layout of a back propagation network.

The example programs are implemented using a three-layer BP neural network (so called because there are three layers of PEs in this implementation). For a back propagation network, the minimum number of lay-

ers is 3, but in more complex situations, the problem may require many more.

The linear associator was described in the previous article to introduce several important characteristics of all neural network architectures. The back propagation neural network is very similar to the linear associator, but some important differences exist, namely: the number of layers, the output function, and the teaching algorithm.

The number of layers affects the organization of the matrix in only a minimal way. In the LA, we had a single connection matrix for the network representing the connections between the PEs in the first and second layers. For the BP network, we have three layers of PEs and two layers of connections. To accommodate this new layer of connections, we need two connection matrices: one for the connections between layers 1 and 2, and one for the connections between layers 2 and 3. Layer 1 receives the inputs from outside, and layer 3 presents the resulting outputs.

The back propagation network may seem like two linear associators placed one on top of the other, but, in the BP network, there are output functions for each PE in each layer. In the LA, the output of each PE was simply its activation level (calculated by collecting the inputs from the previous layer, multiplying them through the connection matrix, and then summing them). In the BP network, the activation level is calculated in a similar manner, but then it is used as the parameter in an output function that actually generates the PE's output.

You no doubt have heard the saying *practice makes perfect.* This phrase is true for back propagation neural networks. For these networks to learn the patterns correctly, you need to present the input and teacher patterns many times (see Figure 1).

The more times you present the input and teacher patterns, the better the system learns to associate these patterns. The total error gives you an idea of the progress your system is making in learning the patterns. As you continue to present the patterns, the total error declines until it eventually reaches a minimum. If you plot the total error against the number of trials, you'll see the error start high, slowly lessen, and eventually reach a minimum value (see Figure 2).

An excellent way to picture this system is to use the analogy of a ball rolling down a hill. Hills generally descend, but they may contain small valleys. Figure 3 illustrates this idea. As the ball rolls down the error hill, it gains momentum. If it has enough momentum to escape the small, secondary valleys on its way down, it eventually ends up at the bottom of the hill.

Hands On

BP is a back propagation simulator that allows you to experiment with your own systems. It handles all of the processing for the network; you simply define the network's characteristics, teach it the patterns you wish it to learn, and then save the network. When you want to have the system recognize these patterns, you simply load the network back into memory and present the input patterns; the system outputs the patterns you taught it. To help you get started, I've included two classic example problems that a back propagation network can learn but that earlier networks, such as the linear associator, cannot.

BP is written in machine language, so you'll need to use *MLX,* the machine language entry program found elsewhere in this issue, to enter it. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: C000
Ending address: CFFF

Once you've finished entering the data, save a copy of the program with the name BP.ML. (The example programs expect to find a file with this name.)

XOR and *ENCODE* are example programs that demonstrate how to use *BP* to simulate a back propagation neural network. Both are written in BASIC, so use *The Automatic Proofreader,* also found in this issue, to prevent typing mistakes as you enter them. Save copies of the programs to the disk containing *BP.*

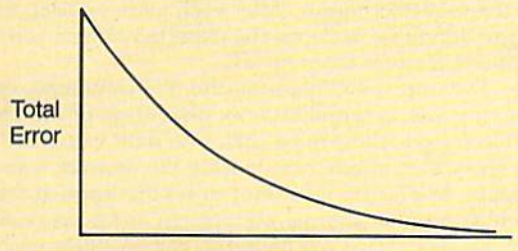
For a quick look at how *BP* works, load the *XOR* example program and type RUN. The program loads *BP,* sets up the network, and then begins learning the patterns. Once it has learned the patterns, the program presents each of the learned patterns to the system and displays the resulting output.

The Tools

BP has six commands for processing and managing a simple back propagation network. In the following paragraphs, you'll find descriptions of what each command does and how to use it. If you don't understand the commands at first, don't worry. You'll understand after we examine the *XOR* example.

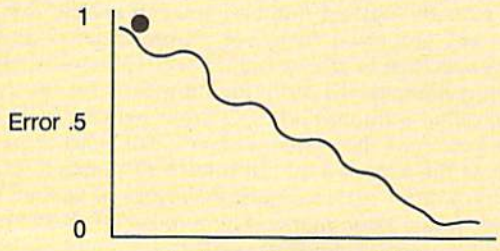
SYS 49152,*fpe,spe,tpe,np,lr,momen,err* Initialize the BP network. This command is used to set up a simple back propagation network. It initializes the system by creating eight BASIC variables and 11 arrays (see Table 1). These variables and arrays are used to hold the results generated by the network. Because they are BASIC variables, they are erased if you perform a NEW or CLR command, load another program, or change the existing program, so be careful. Next, *fpe, spe,* and *tpe* determine how many processing elements are in the first, second, and third layers of the network, respectively. Theoretically, these values can range from 1 to the maximum number of elements free memory will allow. In practice, training times for larger networks could be prohibitively long. The fourth argument, *np,* is the number of patterns that the network is to learn. This value and the number of PEs in

Figure 2



The error starts high but moves lower and eventually crosses a preset threshold.

Figure 3



The error in a neural network acts much like a ball rolling down a hill.

the second layer are interdependent. (If the network doesn't have enough PEs in the second layer to develop internal representations of the patterns, then the program will go into an endless loop.) The argument *lr* is the rate at which the network learns the patterns, and *momen* is the momentum the system has as it learns a pattern. Both of these parameters will be discussed in more detail below. The last argument, *err*, is the maximum allowable error in the system. *BP* uses this value to determine when it has learned the patterns.

Table 1. Variables and Arrays Created by *BP*

Variable	*Meaning*
p1	Number of PEs in layer 1
p2	Number of PEs in layer 2
p3	Number of PEs in layer 3
np	Number of patterns for the system to learn
rate	Learning rate
momentum	Momentum of learning
epsilon	Maximum allowable error
te	Total error after each teaching trial
Array(Size)	*Meaning*
o2(p2)	Output from layer 2
o3(p3)	Output from layer 3
e2(p2)	Error at layer 2
e3(p3)	Error at layer 3
w1(p2,p1)	Connection weights between layers 1 and 2
w2(p3,p2)	Connection weights between layers 2 and 3
m1(p2,p1)	Momentum of the connection weights between layers 1 and 2
m2(p3,p2)	Momentum of the connection weights between layers 2 and 3
t(p3,np)	Teacher patterns
in(p1,np)	Input patterns
e(np)	Error from each pattern

SYS 49155,*pat* Recognize a pattern. After the system has learned the patterns you taught it, use this command to present a pattern for the network to recognize. The *pat* argument is a string of 0s and 1s that represents the pattern. It must contain the same number of 0s and 1s as there are PEs in the first layer.

SYS 49164,*se* Begin learning patterns. Use this command to tell *BP* to begin learning the patterns. Before you use this command, you must initialize the network with the command **SYS 49152** and present the training pairs with the command **SYS 49167**. The show-error argument, *se*, determines whether or not *BP* displays the total error after each learning trial. Set *se* to 1 to display the total error; otherwise, set it to 0.

SYS 49167,*pn,ip,tp* Initialize the training pairs. After you've set up your network, you must use this command to define the patterns the network is to learn. These patterns are given in pairs, called *training pairs*, that consist of an input pattern and a teacher pattern. In the command, *pn* is the pattern number. You can specify the patterns in any order you wish, but you must define all the patterns specified in the *np* parameter of the initialize BP network command. All of the training pairs for the system are called a *training set*. The input pattern, *ip*, is the pattern you want the system to learn. The teacher pattern, *tp*, is the expected output that corresponds to the input pattern. Both patterns must be strings of 0s and 1s enclosed in quotation marks. The number of characters in the input pattern string must equal the number of PEs in the first layer. The number of characters in the teacher pattern must correspond to the number of PEs in the third layer.

SYS 49170,*filename* Save network. This command saves the variables and arrays generated by *BP*. With it, you can recall a network quickly without having to wait for the system to relearn patterns. To save a network, simply type the command followed by the filename in quotation marks.

SYS 49173,*filename* Load network. This command loads a network saved with the save-network command above.

XOR

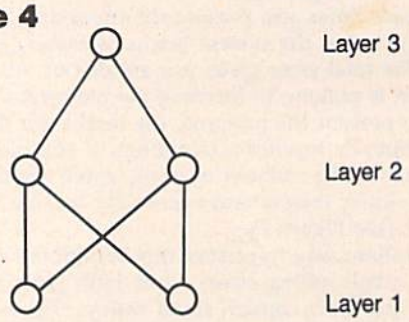
The XOR (exclusive or) function is a classic example of the type of problem the back propagation network can learn to solve. We'll go through *XOR* to show you how to to use *BP*'s functions and to give hints on how to design your own systems.

Table 2. The Exclusive-OR Function

```
0 XOR 0 = 0
1 XOR 0 = 1
0 XOR 1 = 1
1 XOR 1 = 0
```

The XOR function operates on two input values and returns one output value (see Table 2). At the lowest level, the function combines two input bits to generate one output bit. The network represents the XOR function by having two PEs in the first layer and one PE in the third layer (see Figure 4). The number of PEs in the middle layer depends on how many patterns the system must learn. In this case, we want it to learn four patterns, so the second layer contains two PEs. (Two is the minimum number needed to learn four patterns.)

Figure 4



The layout of a BP network to solve the XOR problem.

In line 50 of *XOR*, we initialize the network with the command SYS 49152. The first three values following SYS 49152 determine how many PEs are placed in the first, second, and third layers of the network (2, 2, and 1, respectively). The fourth value indicates that we want to teach the system four patterns.

The network learns the patterns by conducting learning trials. In each trial, the internal representation of a pattern is modified so that its output more closely matches the expected output. After each learning trial, the error is the difference between the expected output and the actual output from the network.

The fifth value following the SYS command, the learning rate, determines what percentage of the error is reduced for each learning trial. The sixth value, the momentum, also affects how quickly the network learns a pattern. In practice, you want to set the learning rate as high as possible and the momentum as low as possible. If the learning rate is too high, the system learns each pattern very quickly, but it destroys other patterns that it may have already learned. If the momentum is set too high, the system learns each pattern quickly, but it forgets the

pattern as soon as it attempts to learn the next. Your objective is to teach the network a set of patterns, not just one pattern. To achieve the best results, you want to maximize the learning rate while minimizing the momentum.

The last value following the SYS command is the total allowable error in the system. After each learning trial, the total error in the system is the sum of the errors for each training pair. When the total error becomes less than the total allowable error, the network has learned the patterns well enough. If you set this value too close to 0, *BP* may never stop trying to learn the patterns.

Learning Patterns

After the network has been initialized, the program initializes the training pairs. Lines 60–90 of the program present the input and teacher patterns.

Now *BP* is ready to run. The SYS 49164 command in line 140 tells it to start learning patterns. The 1 following the SYS command tells *BP* to print the total error after each learning trial. Learning all of the patterns might take quite awhile. You can break out of the program at any time by holding down the RUN/STOP key until the program completes the current trial.

After the network has learned a set of patterns, lines 170–280 display the output from the system. Line 170 presents the first pattern to the system with the command SYS 49155,"00." The pattern must be in quotation marks and should be exactly as long as the number of PEs in the first layer. After the SYS, the arrays o2 and o3 contain the output from layers 2 and 3, respectively.

Another Example

The encoding problem is another classic example of the type of problem the back propagation network can solve. The problem is this: You need to associate four different input patterns with four different output patterns. For the BP network to correctly learn these patterns, it needs to be able to store a representation of these patterns in its middle layer (that is, it needs to learn the correct internal representation). The minimum number of PEs the middle layer can have to represent the association of four different patterns is 2 (see Figure 1). *ENCODE* correctly learns to encode the four different patterns in its middle layer of PEs.

Although back propagation solves many of the problems of the linear associator, it does introduce many new ones. The major drawback of BP neural networks is the long training time. As you can see, the training times for a simple model, such as *XOR*, is one minute, 20 seconds. Unfortunately the times do not increase in a simple linear fashion, but rather in an exponential one, based on the number of PEs you have in each layer. The training time for the encoding example is 27 minutes, 49 seconds—nearly half an hour.

The most important problem to those in cognitive science is that the back propagation neural network is not based on neurophysiological data. It was developed to solve the problems of the linear associator. The next article in the series will examine a group of more biologically plausible models, competitive learning neural networks.

Program 1. BP

```
C000:4C 18 C0 4C 4D C4 4C FE 9F
C008:C6 4C 4B CA 4C B0 CA 4C 1D
C010:04 CB 4C F7 CB 4C 63 CD B3
C018:20 FD AE 20 9E B7 8E A9 9B
C020:02 20 FD AE 20 9E B7 8E CE
C028:AA 02 20 FD AE 20 9E B7 4E
C030:8E AB 02 20 FD AE 20 9E AF
C038:B7 8E AC 02 20 FD AE A5 EA
C040:7A 8D A7 02 A5 7B 8D A8 56
C048:02 A9 8B 85 7A A9 CF 85 9E
C050:7B 20 8B B0 8D AD 02 8C C7
C058:AE 02 AD A7 02 85 7A AD AA
C060:A8 02 85 7B 20 8A AD AE 54
C068:AD 02 AC AE 02 20 D4 BB B7
C070:20 FD AE A5 7A 8D A7 02 0D
C078:A5 7B 8D A8 02 A9 8E 85 41
C080:7A A9 CF 85 7B 20 8B B0 20
C088:8D B1 02 8C B2 02 AD A7 E6
C090:02 85 7A AD A8 02 85 7B 72
C098:20 8A AD AE B1 02 AC B2 0F
C0A0:02 20 D4 BB 20 FD AE A5 7D
C0A8:7A 8D A7 02 A5 7B 8D A8 BE
C0B0:02 A9 91 85 7A A9 CF 85 C7
C0B8:7B 20 8B B0 8D AF 02 8C 38
C0C0:B0 02 AD A7 02 85 7A AD 14
C0C8:A8 02 85 7B 20 8A AD AE BC
C0D0:AF 02 AC B0 02 20 D4 BB 41
C0D8:A5 7A 8D A7 02 A5 7B 8D 23
C0E0:A8 02 A9 94 85 7A A9 CF EE
C0E8:85 7B 20 8B B0 48 98 48 E8
C0F0:AD A9 02 20 3C BC 68 A8 44
C0F8:68 AA 20 D4 BB A9 97 85 E3
C100:7A A9 CF 85 7B 20 8B B0 A1
C108:48 98 48 AD AA 02 20 3C 93
C110:BC 68 A8 68 AA 20 D4 BB E2
C118:A9 9A 85 7A A9 CF 85 7B 82
C120:20 8B B0 48 98 48 AD AB 1E
C128:02 20 3C BC 68 A8 68 AA 69
C130:20 D4 BB A9 9D 85 7A A9 AC
C138:CF 85 7B 20 8B B0 48 98 BE
C140:48 AD AC 02 20 3C BC 68 DC
C148:A8 68 AA 20 D4 BB A9 FC 77
C150:85 7A A9 CF 85 7B 20 8B 4D
C158:B0 8D D2 02 8C D3 02 A9 73
C160:2E 85 7A A9 CF 85 7B AD 7F
C168:2E CF 20 81 B0 A9 A6 85 12
C170:7A A9 CF 85 7B 20 8B B0 12
C178:8D B3 02 8C B4 02 A9 01 BA
C180:20 3C BC AE B3 02 AC B4 59
C188:02 20 D4 BB A9 AC 85 7A F0
C190:A9 CF 85 7B 20 8B B0 8D 63
C198:B5 02 8C B6 02 A9 01 20 4D
C1A0:3C BC AE B5 02 AC B6 02 D4
C1A8:20 D4 BB A9 00 8D 36 03 29
C1B0:A9 B2 85 7A A9 CF 85 7B 21
C1B8:20 8B B0 8D C9 02 8D 34 C3
C1C0:03 8C CA 02 8C 35 03 A9 4B
C1C8:01 20 3C BC AC 35 03 AE 17
C1D0:34 03 20 D4 BB EE 36 03 89
C1D8:AD AC 02 CD 36 03 90 23 7D
C1E0:A9 00 8D 38 03 AD 34 03 A8
C1E8:18 69 05 8D 34 03 AD 35 8A
C1F0:03 69 00 8D 35 03 EE 38 F4
C1F8:03 AD A9 02 CD 38 03 B0 C4
C200:E4 90 C4 A9 00 8D 36 03 F4
C208:8D 38 03 A9 BA 85 7A A9 E7
C210:CF 85 7B 20 8B B0 8D BF 4A
C218:02 8D 34 03 8C C0 02 8C B0
C220:35 03 A9 01 20 3C BC 20 D1
C228:97 E0 20 E2 BA 20 0C BC 0F
C230:A9 05 20 3C BC 20 53 B8 59
C238:AC 35 03 AE 34 03 20 D4 6F
C240:BB EE 36 03 AD 34 03 18 B2
C248:69 05 8D 34 03 AD 35 03 F4
C250:69 00 8D 35 03 AD AA 02 B5
C258:CD 36 03 B0 C5 EE 38 03 1B
C260:AD A9 02 CD 38 03 90 08 3B
C268:A9 00 8D 36 03 4C 22 C2 28
C270:A9 00 8D 36 03 8D 38 03 A1
C278:A9 C2 85 7A A9 CF 85 7B EE
C280:20 8B B0 8D C1 02 8D 34 4D
C288:03 8C C2 02 8C 35 03 A9 14
C290:01 20 3C BC 20 97 E0 20 33
C298:E2 BA 20 0C BC A9 05 20 B9
C2A0:3C BC 20 53 B8 AC 35 03 92
C2A8:AE 34 03 20 D4 BB EE 36 9E
C2B0:03 AD 34 03 18 69 05 8D D7
C2B8:34 03 AD 35 03 69 00 8D 6D
C2C0:35 03 AD AB 02 CD 36 03 C8
C2C8:B0 C5 EE 38 03 AD AA 02 9F
C2D0:CD 38 03 90 08 A9 00 8D 29
C2D8:36 03 4C 8F C2 A9 CA 85 94
C2E0:7A A9 CF 85 7B 20 8B B0 84
C2E8:8D B7 02 8C B8 02 A9 D0 1E
C2F0:85 7A A9 CF 85 7B 20 8B EF
C2F8:B0 8D B9 02 8C BA 02 A9 8E
C300:D6 85 7A A9 CF 85 7B 20 E9
C308:8B B0 8D C7 02 8C C8 02 85
C310:A9 DD 85 7A A9 CF 85 7B 4F
C318:20 8B B0 8D C3 02 8C C4 85
C320:02 A9 E5 85 7A A9 CF 85 C7
C328:7B 20 8B B0 8D C5 02 8C 06
C330:C6 02 A9 ED 85 7A A9 CF E8
C338:85 7B 20 8B B0 8D CB 02 73
C340:8C CC 02 AD B3 02 38 E5 58
C348:2F 8D B3 02 AD B4 02 E5 8B
C350:30 8D B4 02 AD B5 02 38 8A
C358:E5 2F 8D B5 02 AD B6 02 E1
C360:E5 30 8D B6 02 AD B7 02 3C
C368:38 E5 2F 8D B7 02 AD B8 1E
C370:02 E5 30 8D B8 02 AD B9 34
C378:02 38 E5 2F 8D B9 02 AD C3
C380:BA 02 E5 30 8D BA 02 AD AE
C388:BF 02 38 E5 2F 8D BF 02 07
C390:AD C0 02 E5 30 8D C0 02 F8
C398:AD C1 02 38 E5 2F 8D C1 F3
C3A0:02 AD C2 02 E5 30 8D C2 DA
C3A8:02 AD C3 02 38 E5 2F 8D 7A
C3B0:C3 02 AD C4 02 E5 30 8D 32
C3B8:C4 02 AD C5 02 38 E5 2F 21
C3C0:8D C5 02 AD C6 02 E5 30 D5
C3C8:8D C6 02 AD C7 02 38 E5 80
C3D0:2F 8D C7 02 AD C8 02 E5 E6
C3D8:30 8D C8 02 AD C9 02 38 E5
C3E0:E5 2F 8D C9 02 AD CA 02 D3
C3E8:E5 30 8D CA 02 AD CB 02 2E
C3F0:38 E5 2F 8D CB 02 AD CC 5B
C3F8:02 E5 30 8D CC 02 AD AD 51
C400:02 38 E5 2D 8D AD 02 AD FC
C408:AE 02 E5 2E 8D AE 02 AD E1
C410:B1 02 38 E5 2D 8D B1 02 5D
C418:AD B2 02 E5 2E 8D B2 02 D2
C420:AD AF 02 38 E5 2D 8D AF DE
C428:02 AD B0 02 E5 2E 8D B0 08
C430:02 AD D2 02 38 E5 2D 8D E1
C438:D2 02 AD D3 02 E5 2E 8D 30
C440:D3 02 AD A7 02 85 7A AD 2D
C448:A8 02 85 7B 60 A9 00 8D 46
C450:BB 02 20 1C CB F0 18 20 70
C458:FD AE 20 9E B7 8E BB 02 EB
C460:E0 00 F0 08 AD AC 02 CD EA
C468:BB 02 B0 03 4C 48 B2 A9 29
```

Program 1. BP (cont.)

```
C470:01 8D 36 03 A9 00 8D 38 75
C478:03 20 3C BC A2 CD A0 02 6E
C480:20 D4 BB AD BF 02 18 65 3D
C488:2F 8D 34 03 AD C0 02 65 9D
C490:30 8D 35 03 AE 38 03 AC 75
C498:36 03 AD AA 02 20 AA C6 0B
C4A0:AD 34 03 AC 35 03 20 A2 D1
C4A8:BB AD C9 02 18 65 2F 8D 17
C4B0:34 03 AD CA 02 65 30 8D 0B
C4B8:35 03 AE BB 02 AC 38 03 65
C4C0:AD A9 02 20 AA C6 AD 34 CD
C4C8:03 AC 35 03 20 28 BA A9 96
C4D0:CD A0 02 20 67 B8 EE 38 DF
C4D8:03 AD A9 02 CD 38 03 B0 AA
C4E0:9B A9 F2 A0 CF 20 50 B8 63
C4E8:20 ED BF 20 0C BC A9 01 9F
C4F0:20 3C BC 20 6A B8 A9 F7 B4
C4F8:A0 CF 20 0F BB AD B3 02 B9
C500:18 65 2F 8D 34 03 AD B4 6D
C508:02 65 30 8D 35 03 AD 36 14
C510:03 20 90 C6 AE 34 03 AC 9C
C518:35 03 20 D4 BB EE 36 03 59
C520:AD AA 02 CD 36 03 90 03 2C
C528:4C 74 C4 A9 01 8D 36 03 D7
C530:A9 00 8D 38 03 20 3C BC 93
C538:A2 CD A0 02 20 D4 BB AD 36
C540:C1 02 18 65 2F 8D 34 03 A1
C548:AD C2 02 65 30 8D 35 03 17
C550:AE 38 03 AC 36 03 AD AB 31
C558:02 20 AA C6 AD 34 03 AC 9F
C560:35 03 20 A2 BB AD B3 02 73
C568:18 65 2F 8D 34 03 AD B4 D5
C570:02 65 30 8D 35 03 AD 38 7E
C578:03 20 90 C6 AD 34 03 AC FC
C580:35 03 20 28 BA A9 CD A0 A6
C588:02 20 67 B8 EE 38 03 AD A1
C590:AA 02 CD 38 03 B0 A1 A9 F6
C598:F2 A0 CF 20 50 B8 20 ED 55
C5A0:BF 20 0C BC A9 01 20 3C 2F
C5A8:BC 20 6A B8 A9 F7 A0 CF B1
C5B0:20 0F BB AD B5 02 18 65 AD
C5B8:2F 8D 34 03 AD B6 02 65 A7
C5C0:30 8D 35 03 AD 36 03 20 0B
C5C8:90 C6 AE 34 03 AC 35 03 9F
C5D0:20 D4 BB EE 36 03 AD AB CC
C5D8:02 CD 36 03 90 03 4C 30 29
C5E0:C5 A9 00 20 3C BC A9 01 E4
C5E8:8D 36 03 A2 CD A0 02 20 68
C5F0:D4 BB AD B5 02 18 65 2F 51
C5F8:8D 34 03 AD B6 02 65 30 4C
C600:8D 35 03 AD 36 03 20 90 6B
C608:C6 AD 34 03 AC 35 03 20 7B
C610:A2 BB AD C7 02 18 65 2F 7A
C618:8D 34 03 AD C8 02 65 30 FD
C620:8D 35 03 AD AB 02 AC 36 F1
C628:03 AE BB 02 20 AA C6 AD 61
C630:34 03 AC 35 03 20 50 B8 73
C638:A2 D8 A0 02 20 D4 BB A9 F6
C640:D8 A0 02 20 28 BA A9 CD F1
C648:A0 02 20 67 B8 EE 36 03 12
C650:AD AB 02 CD 36 03 B0 93 6F
C658:AD CB 02 18 65 2F 8D 34 A8
C660:03 AD CC 02 65 30 8D 35 D0
C668:03 AD BB 02 20 90 C6 AE F9
C670:34 03 AC 35 03 20 D4 BB BF
C678:A9 02 20 3C BC AD 34 03 2B
C680:AC 35 03 20 0F BB AE 34 0D
C688:03 AC 35 03 20 D4 BB 60 C5
C690:AA E8 CA F0 14 AD 34 03 D8
C698:18 69 05 8D 34 03 AD 35 44
C6A0:03 69 00 8D 35 03 4C 92 C3
C6A8:C6 60 8D FD 03 98 48 E8 37
C6B0:CA F0 2C AC FD 03 C8 AD 6B
C6B8:34 03 18 69 05 8D 34 03 84
C6C0:AD 35 03 69 00 8D 35 03 0D
C6C8:88 F0 E5 AD 34 03 18 69 B5
C6D0:05 8D 34 03 AD 35 03 69 AC
C6D8:00 8D 35 03 4C C8 C6 68 1C
C6E0:4C 90 C6 20 DD BD A0 FF BA
C6E8:C8 B9 00 01 D0 FA C8 98 F5
C6F0:48 A9 00 85 22 A9 01 85 A4
C6F8:23 68 20 24 AB 60 20 57 EE
C700:C4 4C 07 C7 20 6F C4 A9 54
C708:01 8D 36 03 AD C7 02 18 1B
C710:65 2F 8D 34 03 AD C8 02 75
C718:65 30 8D 35 03 AD AB 02 93
C720:AC 36 03 AE BB 02 20 AA AF
C728:C6 AD 34 03 AC 35 03 20 9D
C730:8C BA AD B5 02 18 65 2F 30
C738:8D 34 03 AD B6 02 65 30 8F
C740:8D 35 03 AD 36 03 20 90 AD
C748:C6 AD 34 03 AC 35 03 20 BD
C750:A2 BB 20 53 B8 AD 34 03 41
C758:AC 35 03 20 28 BA A2 CD 2D
C760:A0 02 20 D4 BB AD 34 03 12
C768:AC 35 03 20 A2 BB A9 F7 4D
C770:A0 CF 20 50 B8 A9 CD A0 F5
C778:02 20 28 BA AD B9 02 18 32
C780:65 2F 8D 34 03 AD BA 02 C9
C788:65 30 8D 35 03 AD 36 03 1A
C790:20 90 C6 AE 34 03 AC 35 54
C798:03 20 D4 BB A9 00 8D 38 A8
C7A0:03 AD AD 02 18 65 2D 48 EB
C7A8:AD AE 02 65 2E A8 68 20 56
C7B0:A2 BB AD B9 02 18 65 2F 3C
C7B8:8D 34 03 AD BA 02 65 30 30
C7C0:8D 35 03 AD 36 03 20 90 2E
C7C8:C6 AD 34 03 AC 35 03 20 3E
C7D0:28 BA AD B3 02 18 65 2F 7E
C7D8:8D 34 03 AD B4 02 65 30 20
C7E0:8D 35 03 AD 38 03 20 90 5E
C7E8:C6 AD 34 03 AC 35 03 20 5E
C7F0:28 BA A2 CD A0 02 20 D4 96
C7F8:BB AD B1 02 18 65 2D 48 21
C800:AD B2 02 65 2E A8 68 20 B0
C808:A2 BB AD C5 02 18 65 2F 56
C810:8D 34 03 AD C6 02 65 30 E9
C818:8D 35 03 AD AB 02 AC 36 ED
C820:03 AE 38 03 20 AA C6 AD FC
C828:34 03 AC 35 03 20 28 BA 21
C830:A9 CD A0 02 20 67 B8 AE FC
C838:34 03 AC 35 03 20 D4 BB 8B
C840:AD C1 02 18 65 2F 8D 34 12
C848:03 AD C2 02 65 30 8D 35 7B
C850:03 AD AB 02 AC 36 03 AE 57
C858:38 03 20 AA C6 AD 34 03 CD
C860:AC 35 03 20 67 B8 AE 34 A7
C868:03 AC 35 03 20 D4 BB EE 38
C870:38 03 AD AA 02 CD 38 03 F9
C878:90 03 4C A1 C7 EE 36 03 20
C880:AD AB 02 CD 36 03 90 03 D2
C888:4C 0C C7 A9 01 8D 36 03 84
C890:A9 00 A0 05 99 CC 02 88 E7
C898:D0 FA A9 01 8D 38 03 AD 97
C8A0:B9 02 18 65 2F 8D 34 03 04
C8A8:AD BA 02 65 30 8D 35 03 7B
C8B0:AD 38 03 20 90 C6 AD 34 B8
C8B8:03 AC 35 03 20 A2 BB AD 7E
C8C0:C1 02 18 65 2F 8D 34 03 28
C8C8:AD C2 02 65 30 8D 35 03 9D
C8D0:AD AB 02 AC 38 03 AE 36 90
C8D8:03 20 AA C6 AD 34 03 AC A6
C8E0:35 03 20 28 BA A9 CD A0 0D
C8E8:02 20 67 B8 A2 CD A0 02 8B
C8F0:20 D4 BB EE 38 03 AD AB 03
C8F8:02 CD 38 03 B0 A1 AD B3 51
C900:02 18 65 2F 8D 34 03 AD 2B
C908:B4 02 65 30 8D 35 03 AD 1B
C910:36 03 20 90 C6 AD 34 03 E4
C918:AC 35 03 20 A2 BB A9 F7 01
C920:A0 CF 20 50 B8 AD 34 03 E8
C928:AC 35 03 20 28 BA A9 CD 0F
C930:A0 02 20 28 BA AD B7 02 19
C938:18 65 2F 8D 34 03 AD B8 B1
C940:02 65 30 8D 35 03 AD 36 54
C948:03 20 90 C6 AE 34 03 AC DC
C950:35 03 20 D4 BB A9 00 8D A2
C958:38 03 AD AD 02 18 65 2D C1
C960:48 AD AE 02 65 2E A8 68 17
C968:20 A2 BB AD B7 02 18 65 62
C970:2F 8D 34 03 AD B8 02 65 6F
C978:30 8D 35 03 AD 36 03 20 CA
C980:90 C6 AD 34 03 AC 35 03 3F
C988:20 28 BA AD C9 02 18 65 54
C990:2F 8D 34 03 AD CA 02 65 D7
C998:30 8D 35 03 AD A9 02 AC 43
C9A0:38 03 AE BB 02 20 AA C6 4F
C9A8:AD 34 03 AC 35 03 20 28 69
C9B0:BA A2 CD A0 02 20 D4 BB 04
C9B8:AD B1 02 18 65 2D 48 AD 6F
C9C0:B2 02 65 2E A8 68 20 A2 87
C9C8:BB AD C3 02 18 65 2F 8D 80
C9D0:34 03 AD C4 02 65 30 8D D4
C9D8:35 03 AD AA 02 AC 36 03 5A
C9E0:AE 38 03 20 AA C6 AD 34 3C
C9E8:03 AC 35 03 20 28 BA A9 C0
C9F0:CD A0 02 20 67 B8 AE 34 85
C9F8:03 AC 35 03 20 D4 BB AD 89
CA00:BF 02 18 65 2F 8D 34 03 6A
CA08:AD C0 02 65 30 8D 35 03 60
CA10:AD AA 02 AC 36 03 AE 38 85
CA18:03 20 AA C6 AD 34 03 AC E9
CA20:35 03 20 67 B8 AE 34 03 77
CA28:AC 35 03 20 D4 BB EE 38 6F
CA30:03 AD A9 02 CD 38 03 90 ED
CA38:03 4C 5A C9 EE 36 03 AD 4E
CA40:AA 02 CD 36 03 90 03 4C 75
CA48:90 C8 60 A9 00 20 3C BC B4
CA50:AD D2 02 18 65 2D 8D D4 03
CA58:02 AD D3 02 65 2E 8D D5 C9
CA60:02 AE D4 02 AC D5 02 20 3E
CA68:D4 BB A9 01 8D BB 02 20 1C
CA70:04 C7 AD CB 02 18 65 2F D6
CA78:8D 34 03 AD CC 02 65 30 86
CA80:8D 35 03 AD BB 02 20 90 1C
CA88:C6 AD 34 03 AC 35 03 20 04
CA90:A2 BB AD D4 02 AC D5 02 D9
CA98:20 67 B8 AE D4 02 AC D5 F7
CAA0:02 20 D4 BB EE BB 02 AD AD
CAA8:AC 02 CD BB 02 B0 C0 60 3F
CAB0:20 FD AE 20 9E B7 8E FC 9B
CAB8:03 AD AF 02 18 65 2D 8D 8F
CAC0:D6 02 AD B0 02 65 2E 8D 92
CAC8:D7 02 20 4B CA 20 E1 FF 1E
CAD0:F0 2D AD FC 03 F0 11 AD 5B
CAD8:D4 02 AC D5 02 20 A2 BB DD
CAE0:20 E3 C6 A9 0D 20 D2 FF 81
CAE8:AD D4 02 AC D5 02 20 A2 2F
CAF0:BB AD D6 02 AC D7 02 20 B3
CAF8:5B BC C9 01 F0 CC 60 A0 D0
CB00:00 4C 38 A8 20 FD AE 20 B2
CB08:9E B7 8E BB 02 E0 00 F0 EE
CB10:08 AD AC 02 CD BB 02 B0 DE
CB18:03 4C 48 B2 20 FD AE 20 EE
CB20:9E AD 20 8F AD 20 A6 B6 61
CB28:CD A9 02 D0 EC 8E CD 02 9D
CB30:8C CE 02 A9 00 8D 36 03 42
CB38:A2 01 AC 36 03 AD CD 02 C6
CB40:85 22 AD CE 02 85 23 B1 E3
CB48:22 C9 31 F0 02 A2 00 8A BD
CB50:20 3C BC AD C9 02 18 65 65
CB58:2F 8D 34 03 AD CA 02 65 A3
CB60:30 8D 35 03 AD A9 02 AC 0F
CB68:36 03 C8 AE BB 02 20 AA B0
CB70:C6 AE 34 03 AC 35 03 20 2E
CB78:D4 BB EE 36 03 AD A9 02 CE
CB80:CD 36 03 D0 B3 AD BB 02 C7
CB88:F0 69 20 FD AE 20 9E AD B7
CB90:20 8F AD 20 A6 B6 CD AB 2B
CB98:02 D0 59 8E CD 02 8C CE D7
CBA0:02 A9 00 8D 36 03 A2 01 80
CBA8:AC 36 03 AD CD 02 85 22 03
CBB0:AD CE 02 85 23 B1 22 C9 59
CBB8:31 F0 02 A2 00 8A 20 3C 36
CBC0:BC AD C7 02 18 65 2F 8D 7D
CBC8:34 03 AD C8 02 65 30 8D 11
CBD0:35 03 AD AB 02 AC 36 03 66
CBD8:C8 AE BB 02 20 AA C6 AE FF
CBE0:34 03 AC 35 03 20 D4 BB 3A
CBE8:EE 36 03 AD AB 02 CD 36 F7
CBF0:03 D0 B3 60 4C 48 B2 20 C3
CBF8:0E CF 20 FD AE 20 9E AD 50
CC00:20 8F AD 20 A6 B6 8D 36 A6
CC08:03 A0 00 B1 22 99 DD 02 9B
CC10:C8 CC 36 03 F0 04 C0 14 65
CC18:D0 F1 A9 2C 99 DD 02 C8 9F
CC20:A9 57 99 DD 02 C8 98 A2 7C
CC28:DD A0 02 20 BD FF A9 01 5D
CC30:A2 08 A0 02 20 BA FF 20 5D
CC38:C0 FF A2 0F 20 C6 FF 20 B3
CC40:CF FF C9 30 F0 03 4C 4D 77
CC48:CD 20 CC FF A2 01 20 C9 8D
CC50:FF AD A9 02 20 D2 FF AD A4
CC58:AA 02 20 D2 FF AD AB 02 09
```

Program 1. BP (cont.)

```
CC60:20 D2 FF AD AC 02 20 D2 1A
CC68:FF AE AD 02 AC AE 02 20 C7
CC70:F9 CC AE B1 02 AC B2 02 55
CC78:20 F9 CC AE AF 02 AC B0 B4
CC80:02 20 F9 CC AD BF 02 85 25
CC88:22 AD C0 02 85 23 AC AA 93
CC90:02 AE A9 02 20 11 CD AD BA
CC98:C1 02 85 22 AD C2 02 85 68
CCA0:23 AC AB 02 AE AA 02 20 D0
CCA8:11 CD AD C3 02 85 22 AD 48
CCB0:C4 02 85 23 AC AA 02 AE D2
CCB8:A9 02 20 11 CD AD C5 02 6F
CCC0:85 22 AD C6 02 85 23 AC E0
CCC8:AB 02 AE AA 02 20 11 CD B9
CCD0:AD C9 02 85 22 AD CA 02 AB
CCD8:85 23 AC A9 02 AE AC 02 54
CCE0:20 11 CD AD C7 02 85 22 D6
CCE8:AD C8 02 85 23 AC AB 02 49
CCF0:AE AC 02 20 11 CD 4C 20 C7
CCF8:CF 8A 18 65 2D 85 22 98 D2
CD00:65 2E 85 23 A0 00 B1 22 47
CD08:20 D2 FF C8 C0 05 D0 F6 A7
CD10:60 A5 2F 18 65 22 85 22 8D
CD18:A5 30 65 23 85 23 C8 8C 48
CD20:36 03 8C CD 02 E8 8E 38 0F
CD28:03 A0 00 A2 05 B1 22 20 EA
CD30:D2 FF C8 D0 02 E6 23 CA 18
CD38:D0 F3 A2 05 CE 36 03 D0 04
CD40:EC AD CD 02 8D 36 03 CE B1
CD48:38 03 D0 E1 60 20 D2 FF 22
CD50:20 CF FF C9 0D D0 F6 20 46
CD58:D2 FF 20 E7 FF 20 7A A6 FB
CD60:4C 74 A4 20 0E CF 20 FD C3
CD68:AE 20 9E AD 20 8F AD 20 CC
CD70:A6 B6 8D 36 03 A0 00 B1 6E
CD78:22 99 DD 02 C8 CC 36 03 50
CD80:F0 04 C0 14 D0 F1 A9 2C BC
CD88:99 DD 02 C8 A9 52 99 DD DC
CD90:02 C8 98 A2 DD A0 02 20 32
CD98:BD FF A9 01 A2 08 A0 02 D0
CDA0:20 BA FF 20 C0 FF A2 0F 57
CDA8:20 C6 FF 20 CF FF C9 30 4A
CDB0:D0 9B 20 CC FF A2 01 20 19
CDB8:C6 FF 20 CF FF 8D A9 02 44
CDC0:20 CF FF 8D AA 02 20 CF A6
CDC8:FF 8D AB 02 20 CF FF 8D 2B
CDD0:AC 02 20 B9 CE AE AD 02 71
CDD8:AC AE 02 20 65 CE AE B1 2E
CDE0:02 AC B2 02 20 65 CE AE 02
CDE8:AF 02 AC B0 02 20 65 CE A7
CDF0:AD BF 02 85 22 AD C0 02 37
CDF8:85 23 AC AA 02 AE A9 02 80
CE00:20 7D CE AD C1 02 85 22 05
CE08:AD C2 02 85 23 AC AB 02 EA
CE10:AE AA 02 20 7D CE AD C3 38
CE18:02 85 22 AD C4 02 85 23 93
CE20:AC AA 02 AE A9 02 20 7D FC
CE28:CE AD C5 02 85 22 AD C6 48
CE30:02 85 23 AC AB 02 AE AA CC
CE38:02 20 7D CE AD C9 02 85 99
CE40:22 AD CA 02 85 23 AC A9 8F
CE48:02 AE AC 02 20 7D CE AD 8A
CE50:C7 02 85 22 AD C8 02 85 3F
CE58:23 AC AB 02 AE AC 02 20 94
CE60:7D CE 4C 20 CF 8A 18 65 3A
CE68:2D 85 22 98 65 2E 85 23 DD
CE70:A0 00 20 CF FF 91 22 C8 B2
CE78:C0 05 D0 F6 60 A5 2F 18 51
CE80:65 22 85 22 A5 30 65 23 08
CE88:85 23 C8 8C 36 03 8C CD 38
CE90:02 E8 8E 38 03 A0 00 A2 FB
CE98:05 20 CF FF 91 22 C8 D0 32
CEA0:02 E6 23 CA D0 F3 A2 05 AA
CEA8:CE 36 03 D0 EC AD CD 02 64
CEB0:8D 36 03 CE 38 03 D0 E1 41
CEB8:60 A5 37 A4 38 85 33 84 E3
CEC0:34 A5 2D A4 2E 85 2F 84 3C
CEC8:30 85 31 84 32 A5 7A 8D F8
CED0:A7 02 A5 7B 8D A8 02 A9 EB
CED8:8B 85 7A A9 CF 85 7B 20 33
CEE0:8B B0 8D AD 02 8C AE 02 9E
CEE8:A9 8E 85 7A A9 CF 85 7B 6A
CEF0:20 8B B0 8D B1 02 8C B2 D1
CEF8:02 A9 91 85 7A A9 CF 85 2C
CF00:7B 20 8B B0 8D AF 02 8C 9D
CF08:B0 02 20 E2 C0 60 A9 00 8D
CF10:20 BD FF A9 0F A2 08 A0 7D
CF18:0F 20 BA FF 20 C0 FF 60 03
CF20:20 CC FF A9 01 20 C3 FF AD
CF28:A9 0F 20 C3 FF 60 4F 32 F2
CF30:28 50 32 29 2C 4F 33 28 FD
CF38:50 33 29 2C 45 32 28 50 48
CF40:32 29 2C 45 33 28 50 33 2B
CF48:29 2C 57 31 28 50 32 2C 98
CF50:50 31 29 2C 57 32 28 50 70
CF58:33 2C 50 32 29 2C 4D 31 8F
CF60:28 50 32 2C 50 31 29 2C F6
CF68:4D 32 28 50 33 2C 50 32 62
CF70:29 2C 54 28 50 33 2C 4E B2
CF78:50 29 2C 49 4E 28 50 31 89
CF80:2C 4E 50 29 2C 45 28 4E 7B
CF88:50 29 00 52 41 00 4D 4F B3
CF90:00 45 50 00 50 31 00 50 23
CF98:32 00 50 33 00 4E 50 00 68
CFA0:4F 31 28 30 29 00 4F 32 56
CFA8:28 30 29 00 4F 33 28 30 55
CFB0:29 00 49 4E 28 30 2C 30 7D
CFB8:29 00 57 31 28 30 2C 30 75
CFC0:29 00 57 32 28 30 2C 30 8D
CFC8:29 00 45 32 28 30 29 00 1D
CFD0:45 33 28 30 29 00 54 28 02
CFD8:30 2C 30 29 00 4D 31 28 F3
CFE0:30 2C 30 29 00 4D 32 28 FD
CFE8:30 2C 30 29 00 45 28 30 D9
CFF0:29 00 00 00 00 00 00 81 A6
CFF8:00 00 00 00 54 45 00 00 50
```

Program 2. XOR

```
HR 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS INC. -
      {SPACE}ALL RIGHTS RESERV
      ED
GP 20 PRINT"{CLR}{5}{N}":POKE5
      3280,0:POKE53281,11
QQ 30 IF PEEK(49153)<>24 OR PE
      EK(49157)<>196 THEN LOAD
      "BP.ML",8,1
PC 40 X=RND(-33333)
SD 50 SYS 49152,2,2,1,4,0.25,0
      .9,0.02
CJ 60 SYS 49167,1,"00","0"
QQ 70 SYS 49167,2,"10","1"
ER 80 SYS 49167,3,"01","1"
FC 90 SYS 49167,4,"11","0"
DQ 100 PRINT"LEARNING PATTERNS
      "
KS 110 PRINT
KD 120 PRINT"THE TOTAL ERROR I
      S:"
BX 130 TI$="000000"
GK 140 SYS 49164,1
CS 150 PRINT"TIME SPENT LEARNI
      NG : ";TI$
KG 160 PRINT"{DOWN}RESULTS:
      {DOWN}"
XG 170 SYS49155,"00"
HE 180 PRINT "0 XOR 0 =";INT(O
      3(1)+0.5);
KH 190 PRINT " (";O3(1);")"
JJ 200 SYS49155,"10"
MF 210 PRINT "1 XOR 0 =";INT(O
      3(1)+0.5);
JG 220 PRINT " (";O3(1);")"
DM 230 SYS49155,"01"
BJ 240 PRINT "0 XOR 1 =";INT(O
      3(1)+0.5);
QE 250 PRINT " (";O3(1);")"
BX 260 SYS49155,"11"
DP 270 PRINT "1 XOR 1 =";INT(O
      3(1)+0.5);
AK 280 PRINT " (";O3(1);")"
```

Program 3. ENCODE

```
HR 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS INC. -
      {SPACE}ALL RIGHTS RESERV
      ED
GP 20 PRINT"{CLR}{5}{N}":POKE5
      3280,0:POKE53281,11
QQ 30 IF PEEK(49153)<>24 OR PE
      EK(49157)<>196 THEN LOAD
      "BP.ML",8,1
CM 40 X=RND(-11111)
GQ 50 SYS 49152,4,2,4,4,0.25,0
      .9,0.02
DX 60 SYS 49167,1,"1000","0010
      "
MR 70 SYS 49167,2,"0100","0001
      "
FQ 80 SYS 49167,3,"0010","1000
      "
DF 90 SYS 49167,4,"0001","0100
      "
DQ 100 PRINT"LEARNING PATTERNS
      "
KS 110 PRINT
KD 120 PRINT"THE TOTAL ERROR I
      S:"
BX 130 TI$="000000"
GK 140 SYS 49164,1
JJ 150 PRINT"TIME SPENT LEARNI
      NG : ";TI$:PRINT:PRINT"
      RESULTS:"
RF 160 PRINT"{3 SPACES}LAYER
      {6 SPACES}LAYER
      {7 SPACES}LAYER"
SK 170 PRINT"{4 SPACES}ONE
      {8 SPACES}TWO{8 SPACES}
      THREE"
AC 180 SYS49155,"1000"
CC 190 PRINT "1{2 SPACES}0
      {2 SPACES}0{2 SPACES}0
      {SPACE}-->";INT(O2(1)+0
      .5);INT(O2(2)+0.5);"-->
      ";
DC 200 FOR I= 1 TO 4
HB 210 PRINT INT(O3(I)+0.5);
QD 220 NEXT I
PG 230 PRINT
MB 240 SYS49155,"0100"
MS 250 PRINT "0{2 SPACES}1
      {2 SPACES}0{2 SPACES}0
      {SPACE}-->";INT(O2(1)+0
      .5);INT(O2(2)+0.5);"-->
      ";
PG 260 FOR I= 1 TO 4
XE 270 PRINT INT(O3(I)+0.5);
EH 280 NEXT I
DM 290 PRINT
QE 300 SYS49155,"0010"
CP 310 PRINT "0{2 SPACES}0
      {2 SPACES}1{2 SPACES}0
      {SPACE}-->";INT(O2(1)+0
      .5);INT(O2(2)+0.5);"-->
      ";
GM 320 FOR I= 1 TO 4
JK 330 PRINT INT(O3(I)+0.5);
XP 340 NEXT I
GR 350 PRINT
FK 360 SYS49155,"0001"
JG 370 PRINT "0{2 SPACES}0
      {2 SPACES}0{2 SPACES}1
      {SPACE}-->";INT(O2(1)+0
      .5);INT(O2(2)+0.5);"-->
      ";
SS 380 FOR I= 1 TO 4
AR 390 PRINT INT(O3(I)+0.5);
CS 400 NEXT I
SB 410 PRINT
```

G

EDITOR'S CHOICE

QEWB

Robert Bixby

Here's an electronic jigsaw puzzle with a twist, a slide, and a spin. This mind bender for the 64 will keep you coming back again and again.

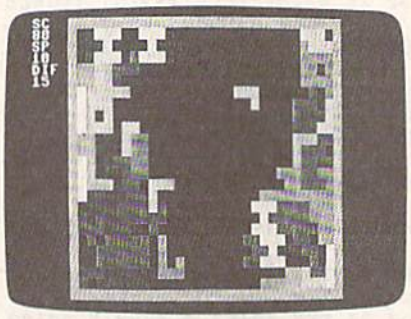
Jigsaw puzzles have entertained people for decades, but there's one problem with them: Once you've completed a puzzle, you must either undo your work and start over or get a new puzzle.

Qewb is an animated electronic jigsaw puzzle that solves this problem once and for all. With its revolving game board, rotating pieces, and multiple difficulty levels, *Qewb* provides an unlimited number of puzzles in a single package.

Typing It In

Qewb is written entirely in machine language, so you must use *MLX*, the machine language entry program found elsewhere in this issue, to enter it. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: 0801
Ending address: 19A0



In Qewb, the double-sided-board option makes for an especially challenging game.

Follow the *MLX* instructions carefully, and be sure to save a copy of the program to disk or tape before you exit *MLX*. To start *Qewb*, simply load and run it as you would any BASIC program.

The object of *Qewb* is to position as many pieces on the board as possible. In order to do this, you must place the pieces next to one another without leaving gaps. On the lower levels, the pieces are simple and fit together easily. Later, they become more complex and are more difficult to position.

Game Options

When you run *Qewb*, you'll see the first option screen. From here, you can adjust the difficulty of the game in two ways. First, you can make the game harder or easier by pressing H or E, respectively. Second, you can change the game's speed setting: Press S to slow the game; press F to make it faster. After you've set the difficulty level, press RETURN to continue.

The next option screen describes the game controls and also allows you to pick the type of game that you'll play. You can choose between a revolving or a stationary game board, rotating or nonrotating pieces, and a single- or a double-sided board.

The revolving-board option causes the board to scroll from bottom to top each time a new piece appears. As pieces move off the top of the screen, they reappear at the bottom. Choosing this option generally makes the game easier to play.

The rotating-pieces option causes a piece to rotate as it moves across the board. Each piece rotates a quarter turn as it moves one space. This option

makes placing pieces especially challenging at greater speeds.

The single-/double-sided board option lets you place pieces on one or both sides of the board, respectively. Gameplay is easier with a single-sided board because you only need to concentrate on one side of the board at once. When you've set all the options, press RETURN to begin play.

Playing the Game

The game board itself occupies most of the playing screen. Your score, the speed, and the difficulty setting are also displayed. As the game begins, the game board is empty and pieces begin to appear one at a time. Each piece moves directly to the side of the board unless you change its path. If you're playing a double-sided game, a piece appears in the center of the board and moves to one side or the other. If you're playing a single-sided game, the piece appears on the right side and moves to the left.

You can move a piece toward the top of the board by pressing J. Pressing L moves it toward the bottom of the board. If you haven't selected the automatic-rotation option from the second option screen, you can rotate a piece by pressing K.

Pieces can be seated manually or automatically. If the current piece comes into contact with another piece as it moves toward the side of the board, the piece seats itself automatically. Because seating doesn't occur immediately upon contact, you'll have a brief moment to slide the piece before it's permanently positioned. If you want to seat a piece manually, press the space bar; the piece will move directly to the side of the board.

To pause a game at any time, press the RUN/STOP key. To continue play, press any other key. To abort the current game, press the back-arrow key (←).

When a game is over, *Qewb* prompts you for your name and then displays the high scores for the session. To play another game, press Y; to exit to BASIC, press N.

Qewb

```
0801:0B 08 FF FF 9E 32 32 38 F2
0809:38 00 EE 08 FF FF 8F 22 D4
0811:0D 0D 0D 0D 0D 0D 0D 0D 21
0819:0D 0D 0D 0D 0D 0D 0D 0D 29
0821:0D 0D 0D 0D 0D 0D 0D 0D 31
0829:20 20 20 20 20 20 20 20 39
0831:20 20 20 20 B0 C0 C0 C0 2A
0839:C0 C0 C0 C0 C0 C0 C0 C0 49
0841:C0 C0 C0 AE 0D 20 20 20 2E
0849:20 20 20 20 20 B0 C0 C0 7D
0851:C0 BD 43 4F 50 59 52 49 64
0859:47 48 54 20 31 39 38 39 C3
0861:AD C0 C0 C0 AE 0D 20 20 A6
0869:20 20 20 20 20 20 DD 43 18
0871:4F 4D 50 55 54 45 21 20 F5
0879:20 50 55 42 4C 49 43 41 CB
0881:54 49 4F 4E 53 DD 0D 20 29
0889:20 20 20 20 20 20 20 AD 27
0891:C0 C0 AE 33 32 34 20 20 FD
0899:57 2E 20 57 45 4E 44 4F 95
08A1:56 45 52 B0 C0 C0 BD 0D 15
08A9:20 20 20 20 20 20 20 20 B9
08B1:20 20 20 AD AE 47 52 45 35
08B9:45 4E 53 42 4F 52 4F 2C 1D
08C1:20 4E 43 B0 BD 0D 20 20 6B
08C9:20 20 20 20 20 20 20 20 D9
08D1:20 20 AD C0 C0 C0 C0 C0 07
08D9:C0 C0 C0 C0 C0 C0 C0 C0 E9
08E1:C0 BD 0D 0D 0D 0D 0D 0D F7
08E9:0D 0D 0D 0D 00 00 00 A9 DF
08F1:00 8D 20 D0 8D 21 D0 A9 B2
08F9:90 20 D2 FF EA EA EA 20 AD
0901:B5 18 4C 50 09 51 45 57 F1
0909:42 72 2E 20 62 49 58 42 CB
0911:59 43 2F 4F 20 63 6F 6D 56
0919:70 75 74 65 21 20 62 4F 43
0921:4F 4B 53 33 32 34 20 77 65
0929:2E 20 77 45 4E 44 4F 56 16
0931:45 52 73 55 49 54 45 20 84
0939:32 30 30 67 52 45 45 4E 6D
0941:53 42 4F 52 4F 2C 20 6E 76
0949:63 20 32 37 34 30 35 20 BB
0951:21 0A 20 5F 0D 4C 60 0F D9
0959:A0 00 A5 C5 C9 02 D0 06 CA
0961:A9 00 8D E4 18 60 C9 07 25
0969:D0 04 A9 01 D0 F4 88 D0 66
0971:E9 AD 1B D4 29 01 4C 63 DD
0979:09 20 20 44 09 06 06 09 D5
0981:03 15 0C 14 19 20 4C 05 04
0989:16 05 0C 20 20 20 20 20 4D
0991:20 20 47 01 0D 05 20 53 C4
0999:10 05 05 04 20 20 20 20 B7
09A1:20 05 20 12 68 92 20 4D 45
09A9:41 4B 45 53 20 47 41 4D FA
09B1:45 20 48 41 52 44 45 52 0C
09B9:2C 20 12 65 92 20 4D 41 73
09C1:4B 45 53 20 49 54 20 45 58
09C9:41 53 49 45 52 0D 20 12 E7
09D1:66 92 20 4D 41 4B 45 53 A9
09D9:20 47 41 4D 45 20 46 41 43
09E1:53 54 45 52 2C 20 12 73 F9
09E9:92 20 4D 41 4B 45 53 20 41
09F1:49 54 20 53 4C 4F 57 45 8A
09F9:52 0D 20 20 20 20 20 70 B0
0A01:52 45 53 53 20 12 72 45 A2
0A09:54 55 52 4E 92 20 54 4F D8
0A11:20 4D 41 4B 45 20 53 45 FB
0A19:4C 45 43 54 49 4F 4E 00 76
0A21:A9 93 20 D2 FF A2 0A A0 5F
0A29:00 18 20 F0 FF A0 00 B9 92
0A31:A2 09 F0 07 20 D2 FF C8 7C
0A39:4C 30 0A A0 00 B9 7A 09 AF
0A41:99 32 04 A9 A0 99 5A 04 ED
0A49:B9 8E 09 99 AA 04 A9 A0 F1
0A51:99 D2 04 C8 C0 14 90 E5 51
0A59:A9 C8 8D 6F 04 A9 C5 8D FC
0A61:58 04 A9 C6 8D E7 04 A9 02
0A69:D3 8D D0 04 A0 00 A2 00 6F
0A71:A9 01 99 5A D8 C8 CC E2 D9
0A79:18 90 F5 9D D2 D8 E8 EC 0F
0A81:E5 18 90 F7 A9 02 99 5A 03
0A89:D8 C8 C0 14 90 F6 9D D2 04
0A91:D8 E8 E0 14 90 F8 A5 C5 23
0A99:C9 40 F0 FA C9 0E D0 10 A8
0AA1:CE E2 18 AD E2 18 D0 4F 1C
0AA9:A9 01 8D E2 18 4C F8 0A A0
0AB1:C9 1D D0 12 EE E2 18 AD 0E
0AB9:E2 18 C9 14 90 39 A9 13 8F
0AC1:8D E2 18 4C F8 0A C9 0D AD
0AC9:D0 10 CE E5 18 AD E5 18 DD
0AD1:D0 25 A9 01 8D E5 18 4C 5D
0AD9:F8 0A C9 15 D0 12 EE E5 0A
0AE1:18 AD E5 18 C9 14 90 0F 7A
0AE9:A9 13 8D E5 18 4C F8 0A 95
0AF1:C9 01 D0 03 4C A0 0C 20 92
0AF9:FE 0A 4C 6D 0A A2 00 A0 EB
0B01:80 CA D0 FD 88 D0 FA 60 E1
0B09:93 0D 0D 0D 20 20 20 20 80
0B11:73 45 54 20 53 50 45 43 68
0B19:49 41 4C 20 50 52 4F 50 6A
0B21:45 52 54 49 45 53 20 20 65
0B29:4F 46 20 47 41 4D 45 2E E8
0B31:0D 20 20 20 20 20 20 20 BD
0B39:20 70 52 45 53 53 20 48 8A
0B41:49 47 48 4C 49 47 48 54 E7
0B49:45 44 20 4C 45 54 54 45 45
0B51:52 0D 20 20 20 20 20 20 BB
0B59:20 20 20 20 20 54 4F 20 9E
0B61:43 48 41 4E 47 45 20 53 1B
0B69:45 54 54 49 4E 47 2C 0D 4B
0B71:20 20 20 20 20 20 20 20 87
0B79:20 50 52 45 53 53 20 12 8C
0B81:72 45 54 55 52 4E 92 20 13
0B89:20 54 4F 20 50 4C 41 59 40
0B91:2E 00 20 20 20 20 20 12 98
0B99:6A 92 20 41 4E 44 20 12 77
0BA1:6C 92 20 4B 45 59 53 20 A1
0BA9:4D 4F 56 45 20 50 55 5A A0
0BB1:5A 4C 45 20 50 49 45 43 28
0BB9:45 0D 20 20 20 20 20 20 9D
0BC1:20 20 20 20 20 20 20 20 D7
0BC9:55 50 20 41 4E 44 20 44 BE
0BD1:4F 57 4E 0D 20 20 20 20 E1
0BD9:20 20 20 20 20 20 12 6B 1F
0BE1:92 20 4B 45 59 20 52 4F 46
0BE9:54 41 54 45 53 20 50 49 5E
0BF1:45 43 45 0D 20 20 20 20 D6
0BF9:20 20 20 20 20 20 12 73 47
0C01:50 41 43 45 42 41 52 92 9C
0C09:20 44 52 4F 50 53 20 50 E1
0C11:49 45 43 45 0D 20 20 20 25
0C19:12 5F 92 20 48 41 4C 54 9A
0C21:53 20 47 41 4D 45 2C 20 DF
0C29:12 72 75 6E 2F 73 74 6F 1C
0C31:70 92 20 50 41 55 53 45 7A
0C39:53 20 47 41 4D 45 00 72 F1
0C41:4F 12 54 92 41 54 49 4E 75
0C49:47 20 20 20 20 20 20 6E 43
0C51:4F 4E 52 4F 12 54 92 41 2C
0C59:54 49 4E 47 20 20 20 72 60
0C61:45 12 56 92 4F 4C 56 49 36
0C69:4E 47 20 20 20 20 00 6E 70
0C71:4F 4E 52 45 12 56 92 4F C1
0C79:4C 56 49 4E 47 20 20 64 BA
0C81:4F 55 42 4C 45 2D 12 53 F9
0C89:92 49 44 45 44 20 20 73 70
0C91:49 4E 47 4C 45 2D 12 53 E5
0C99:92 49 44 45 44 20 20 A0 AD
0CA1:00 B9 09 0B F0 07 20 D2 B0
0CA9:FF C8 4C A2 0C A0 00 A2 2D
0CB1:13 18 20 F0 FF A0 00 B9 A8
0CB9:93 0B F0 07 20 D2 FF C8 02
0CC1:4C B8 0C A2 0A A0 0F 18 E2
0CC9:20 F0 FF AD EA 18 0A 0A DE
0CD1:0A 0A A8 A2 00 B9 60 0C 64
0CD9:20 D2 FF C8 E8 E0 10 90 BE
0CE1:F4 A2 0C A0 0F 18 20 F0 B2
0CE9:FF AD E9 18 0A 0A 0A 0A C2
0CF1:A8 A2 00 B9 40 0C 20 D2 E7
0CF9:FF C8 E8 E0 10 90 F4 A2 BE
0D01:0E A0 0F 18 20 F0 FF AD 20
0D09:EB 18 0A 0A 0A 0A A8 A2 6D
0D11:00 B9 80 0C 20 D2 FF C8 7F
0D19:E8 E0 10 90 F4 A5 C5 C9 7E
0D21:40 F0 FA C9 0D D0 0B AD 03
0D29:EB 18 49 01 8D EB 18 4C 11
0D31:56 0D C9 16 D0 0B AD E9 4C
0D39:18 49 01 8D E9 18 4C 56 49
0D41:0D C9 1F D0 0B AD EA 18 42
0D49:49 01 8D EA 18 4C 56 0D 54
0D51:C9 01 D0 C9 60 A5 C5 C9 36
0D59:40 D0 FA 4C A0 0C 20 87 E8
0D61:0D AD E2 18 4A 8D E6 18 B9
0D69:A9 19 38 ED E5 18 8D E7 17
0D71:18 AD E2 18 C9 10 90 02 92
0D79:A9 0F 8D E8 18 A0 00 8C 3C
0D81:F3 18 8C F2 18 60 EA A9 1E
0D89:93 20 D2 FF A0 00 A9 0F 37
0D91:99 00 D8 99 00 D9 99 00 C7
0D99:DA 99 00 DB C8 D0 EF A9 58
0DA1:FF 8D 0E D4 8D 0F D4 A9 2A
0DA9:80 8D 12 D4 A9 28 85 FB EB
0DB1:A9 04 85 FC A0 04 A9 A0 2B
0DB9:91 FB A0 23 91 FB A5 FB A5
0DC1:18 69 28 85 FB 90 02 E6 AC
0DC9:FC A5 FB C9 C0 D0 E5 A0 9D
```

Qewb

```
0DD1:04 A9 A0 99 00 04 99 C0 0A
0DD9:07 C8 C0 24 90 F3 60 02 1B
0DE1:ED 18 AD ED 18 C9 04 90 0E
0DE9:05 A9 00 8D ED 18 60 A2 FC
0DF1:00 A0 20 CA D0 FD 88 D0 45
0DF9:FA 60 C4 60 2E 80 C4 60 A5
0E01:2E 80 00 F0 22 22 0F 00 1B
0E09:44 44 06 22 07 40 44 60 5D
0E11:02 E0 0E 20 06 44 04 70 E3
0E19:22 60 04 E0 02 62 07 20 B4
0E21:46 40 06 60 06 60 06 60 55
0E29:06 60 07 E0 46 62 07 E0 F9
0E31:46 62 0E 70 26 64 0E 70 21
0E39:26 64 C4 60 2E 80 C4 60 7D
0E41:2E 80 4E 40 04 E4 02 72 8C
0E49:27 20 0F F0 66 66 0F F0 CD
0E51:66 66 4E A0 6C 60 AE 40 90
0E59:C6 C0 44 57 31 F0 EA 22 4C
0E61:0F 8C E4 E0 AE A0 E4 E0 75
0E69:AE A0 0E 00 44 40 0E 00 06
0E71:44 40 22 E0 88 E0 E8 80 2C
0E79:E2 20 C6 31 13 6C 63 8C 98
0E81:C8 36 28 14 28 14 28 14 CB
0E89:28 14 A0 A0 20 20 20 A0 3F
0E91:20 20 20 A0 A0 20 20 20 B9
0E99:20 20 C4 60 80 40 20 10 C1
0EA1:08 04 02 01 A9 20 A2 00 26
0EA9:9D 8B 0E E8 E0 10 90 F8 29
0EB1:AD EC 18 0A 0A 0A AA A0 F1
0EB9:00 BD 03 0E 99 FB 0D E8 46
0EC1:C8 C0 08 90 F4 AD ED 18 CE
0EC9:0A AA BD FB 0D 8D 9B 0E F0
0ED1:E8 BD FB 0D 8D 9C 0E A2 BF
0ED9:00 AD 9B 0E 3D 9D 0E F0 23
0EE1:05 A9 A0 9D 8B 0E AD 9C 65
0EE9:0E 3D 9D 0E F0 05 A9 A0 80
0EF1:9D 93 0E E8 E0 08 90 E1 3C
0EF9:60 0C 0C 00 04 28 04 50 E3
0F01:04 78 04 A0 04 C8 04 F0 06
0F09:04 18 05 40 05 68 05 90 38
0F11:05 B8 05 E0 05 08 06 30 13
0F19:06 58 06 80 06 A8 06 D0 C8
0F21:06 F8 06 20 07 48 07 70 1B
0F29:07 98 07 C0 07 00 D8 28 EF
0F31:D8 50 D8 78 D8 A0 D8 C8 36
0F39:D8 F0 D8 18 D9 40 D9 68 88
0F41:D9 90 D9 B8 D9 E0 D9 08 45
0F49:DA 30 DA 58 DA 80 DA A8 F8
0F51:DA D0 DA F8 DA 20 DB 48 53
0F59:DB 70 DB 98 DB C0 DB A5 C5
0F61:C5 C9 40 D0 FA 20 1B 12 8A
0F69:AD EA 18 D0 03 20 F4 13 BE
0F71:A9 0C 8D FB 0E AD EB 18 EF
0F79:F0 04 A9 1E D0 02 A9 12 1C
0F81:8D FA 0E AD 1B D4 29 0F 4F
0F89:CD E8 18 B0 F6 8D EC 18 B6
0F91:18 69 01 8D EE 18 18 6D 84
0F99:1B D4 29 03 8D E0 0D 20 F9
0FA1:A5 0E 20 20 13 20 59 09 F0
0FA9:A9 00 8D F0 18 20 21 11 F1
0FB1:20 F0 0D CE EF 18 D0 21 4D
0FB9:AD E7 18 8D EF 18 AD E9 A9
0FC1:18 D0 03 20 2B 10 AD EB 63
0FC9:18 D0 05 AD E4 18 F0 06 13
0FD1:20 B3 10 4C DA 0F 20 D9 E0
0FD9:10 A5 C5 C9 3C D0 09 20 16
0FE1:57 10 20 F0 0D 4C AE 0F C8
0FE9:C9 22 D0 09 20 FF 10 20 61
0FF1:F0 0D 4C AE 0F C9 2A D0 05
0FF9:09 20 10 11 20 F0 0D 4C E2
1001:AE 0F C9 25 D0 09 20 2B DD
1009:10 20 F0 0D 4C AE 0F C9 2D
1011:39 D0 03 4C 60 14 C9 3F 4D
1019:D0 93 A5 C5 C9 40 D0 FA 83
1021:A5 C5 C9 40 F0 FA 4C AE 7D
1029:0F 01 20 63 11 AD ED 18 7E
1031:8D 2A 10 EE ED 18 AD ED AC
1039:18 C9 04 90 05 A9 00 8D BD
1041:ED 18 20 A5 0E 20 A9 11 12
1049:F0 09 AD 2A 10 8D ED 18 27
1051:20 A5 0E 4C 21 11 AD EB 06
1059:18 D0 05 AD E4 18 F0 29 C7
1061:20 63 11 CE FA 0E 20 A9 73
1069:11 F0 13 EE FA 0E 20 21 11
1071:11 68 68 AD F0 18 D0 03 A8
1079:4C 60 14 4C 60 0F A9 01 B2
1081:8D F0 18 20 21 11 4C 61 F0
1089:10 20 63 11 EE FA 0E 20 D6
1091:A9 11 F0 13 CE FA 0E 20 B8
1099:21 11 68 68 AD F0 18 D0 54
10A1:03 4C 60 14 4C 60 0F A9 4F
10A9:01 8D F0 18 20 21 11 4C 41
10B1:8A 10 20 63 11 CE FA 0E 1D
10B9:20 A9 11 F0 13 EE FA 0E DD
10C1:20 21 11 68 68 AD F0 18 D6
10C9:D0 03 4C 60 14 4C 60 0F 44
10D1:A9 01 8D F0 18 4C 21 11 0D
10D9:20 63 11 EE FA 0E 20 A9 ED
10E1:11 F0 13 CE FA 0E 20 21 87
10E9:11 68 68 AD F0 18 D0 03 21
10F1:4C 60 14 4C 60 0F A9 01 2B
10F9:8D F0 18 4C 21 11 20 63 D5
1101:11 CE FB 0E 20 A9 11 F0 7A
1109:03 EE FB 0E 4C 21 11 20 F1
1111:63 11 EE FB 0E 20 A9 11 1C
1119:F0 03 CE FB 0E 4C 21 11 03
1121:20 FC 11 BD 8B 0E C9 A0 59
1129:D0 07 91 19 AD EE 18 91 24
1131:21 BD 8F 0E C9 A0 D0 07 9F
1139:91 1B AD EE 18 91 23 BD 9A
1141:93 0E C9 A0 D0 07 91 1D D6
1149:AD EE 18 91 25 BD 97 0E 77
1151:C9 A0 D0 07 91 1F AD EE 5E
1159:18 91 27 C8 E8 E0 04 90 C0
1161:C2 60 20 FC 11 BD 8B 0E 75
1169:C9 A0 D0 08 A9 20 91 19 3D
1171:A9 0F 91 21 BD 8F 0E C9 82
1179:A0 D0 08 A9 20 91 1B A9 E2
1181:0F 91 23 BD 93 0E C9 A0 D8
1189:D0 08 A9 20 91 1D A9 0F B0
1191:91 25 BD 97 0E C9 A0 D0 A0
1199:08 A9 20 91 1F A9 0F 91 96
11A1:27 C8 E8 E0 04 90 BE 60 F4
11A9:20 FC 11 A9 00 8D FB 11 17
11B1:BD 8B 0E C9 20 F0 09 B1 7C
11B9:19 C9 20 F0 03 EE FB 11 CA
11C1:BD 8F 0E C9 20 F0 09 B1 8D
11C9:1B C9 20 F0 03 EE FB 11 DB
11D1:BD 93 0E C9 20 F0 09 B1 9E
11D9:1D C9 20 F0 03 EE FB 11 EC
11E1:BD 97 0E C9 20 F0 09 B1 AF
11E9:1F C9 20 F0 03 EE FB 11 FD
11F1:C8 E8 E0 04 90 BA AD FB D5
11F9:11 60 00 AD FB 0E 0A AA 6E
1201:A0 00 BD FC 0E 99 19 00 06
1209:BD 2E 0F 99 21 00 E8 C8 B6
1211:C0 08 90 EE AC FA 0E A2 A8
1219:00 60 EA A9 04 85 FC A9 27
1221:28 85 FB A0 05 B1 FB C9 F4
1229:A0 F0 0E A9 04 85 FC A9 10
1231:28 85 FB C8 C0 23 90 ED 78
1239:60 A5 FB 18 69 28 85 FB EA
1241:90 02 E6 FC A5 FB C9 C0 4C
1249:D0 DB AD F2 18 29 7F C9 DF
1251:7D 90 01 60 AD F2 18 18 FF
1259:69 01 8D F2 18 90 03 EE 4B
1261:F3 18 4C 26 12 AD EB 18 A8
1269:F0 03 4C 75 12 C0 14 90 F3
1271:03 4C CE 12 A9 28 85 FB 1A
1279:85 FD A9 04 85 FC A9 D8 A1
1281:85 FE 8C F1 18 B1 FD 48 A4
1289:A9 0F 91 FD B1 FB 48 A9 10
1291:20 91 FB 88 68 91 FB 68 1C
1299:91 FD C8 AD EB 18 F0 05 A0
12A1:C0 22 4C A8 12 C0 14 90 0F
12A9:B9 AC F1 18 A5 FB 18 69 4C
12B1:28 85 FB 85 FD 90 9D E6 77
12B9:FE E6 FC C9 C0 D0 A3 A9 8D
12C1:04 85 FC A9 28 85 FB AC 7F
12C9:F1 18 4C 26 12 A9 28 85 E5
12D1:FB 85 FD A9 04 85 FC A9 89
12D9:D8 85 FE 8C F1 18 88 B1 27
12E1:FD 48 A9 0F 91 FD B1 FB 21
12E9:48 A9 20 91 FB C8 68 91 1F
12F1:FB 68 91 FD 88 C0 15 B0 62
12F9:E5 AC F1 18 A5 FB 18 69 B2
1301:28 85 FB 85 FD 90 04 E6 95
1309:FE E6 FC A5 FB C9 C0 D0 BB
1311:CD A9 04 85 FC A9 28 85 C5
1319:FB AC F1 18 4C 26 12 EE 36
1321:F2 18 AD F2 18 D0 03 EE A4
1329:F3 18 AD F2 18 29 3F C9 E1
1331:20 D0 0A AD E8 18 C9 0F 02
1339:B0 03 EE E8 18 AD F2 18 5A
1341:29 3F C9 3F D0 0A AD E7 EA
1349:18 C9 02 90 03 CE E7 18 72
1351:AD F2 18 29 7F C9 7F D0 93
1359:03 20 87 0D A0 00 B9 A4 E7
1361:13 F0 07 20 D2 FF C8 4C A4
1369:5F 13 AD F3 18 AE F2 18 72
1371:20 CD BD A0 00 B9 A9 13 2A
1379:F0 07 20 D2 FF C8 4C 76 3D
1381:13 A9 19 38 ED E7 18 AA 2C
1389:A9 00 20 CD BD A0 00 B9 8F
1391:AE 13 F0 07 20 D2 FF C8 77
1399:4C 90 13 AE E8 18 A9 00 52
13A1:4C CD BD 13 73 63 0D 00 8D
13A9:0D 73 70 0D 00 0D 64 69 78
13B1:66 0D 00 20 20 20 A0 A0 B3
13B9:A0 A0 20 20 20 20 20 20 40
13C1:20 20 20 20 20 20 20 20 E7
13C9:20 20 20 20 20 20 20 20 EF
13D1:20 41 41 FF 0F AF 26 05 09
13D9:A5 F1 0F 2F FF 2F 0F 0F 0E
13E1:FF 0F AF 0F 2F FF 0F 2F 79
13E9:0F 0F 2F 0F 2F 0F 0F AF B5
13F1:FF 41 41 A9 2D 85 19 85 62
13F9:1D A9 55 85 1B 85 1F A9 F2
1401:04 85 1A 85 1C A9 D8 85 E6
1409:1E 85 20 A0 00 A2 00 B1 EB
1411:19 99 B4 13 B1 1D 99 D4 FD
1419:13 C8 C0 1E 90 F1 A0 00 84
1421:B1 1B 91 19 B1 1F 91 1D F6
1429:C8 C0 1E 90 F3 A5 1C 85 A6
1431:1A A5 20 85 1E A5 1B 85 6F
1439:19 85 1D 18 69 28 85 1B 86
1441:85 1F 90 04 E6 1C E6 20 DB
1449:E8 E0 16 90 D1 A0 00 B9 B4
1451:B4 13 91 19 B9 D4 13 91 35
1459:1D C8 C0 1E 90 F1 60 20 69
1461:C0 15 A2 00 86 C6 BD 92 E0
1469:15 F0 07 20 D2 FF E8 4C EF
1471:67 14 A0 00 8C F8 18 20 FE
1479:CF FF C9 0D F0 26 C9 14 5B
1481:D0 09 AC F8 18 F0 F0 88 68
1489:8C F8 18 C9 5B B0 E8 C9 0F
1491:20 90 E4 AC F8 18 99 19 C9
1499:19 C8 8C F8 18 C0 08 B0 26
14A1:16 4C 78 14 AC F8 18 A9 5B
14A9:20 99 19 19 C8 8C F8 18 7F
14B1:C0 08 B0 03 4C A5 14 AD 51
14B9:F3 18 CD 09 19 90 2B F0 7E
14C1:05 B0 0D 4C 65 15 AD F2 CC
14C9:18 CD F9 18 90 1C F0 1A 23
14D1:EA AD F2 18 8D F9 18 AD EC
14D9:F3 18 8D 09 19 A0 00 B9 49
14E1:19 19 99 29 19 C8 C0 08 18
14E9:90 F5 20 EC 15 A9 93 20 41
14F1:D2 FF 20 C0 15 A9 13 20 29
14F9:D2 FF A0 00 A9 11 20 D2 44
1501:FF C8 C0 09 90 F6 A2 08 B3
1509:8E F8 18 A9 0C 20 A9 15 9F
1511:AC F8 18 B9 F9 18 AA B9 AD
1519:09 19 20 CD BD A0 00 A9 09
1521:2E 20 D2 FF C8 C0 0A 90 B2
1529:F6 A9 0D 20 D2 FF A9 91 58
1531:20 D2 FF A9 15 20 A9 15 4C
1539:AD F8 18 0A 0A 0A AA A0 8A
1541:00 BD 29 19 C9 20 90 07 88
1549:C9 5B B0 03 20 D2 FF E8 AA
1551:C8 C0 08 90 EC CE F8 18 C6
1559:A9 0D 20 D2 FF AD F8 18 8D
1561:C9 FF D0 A7 A0 00 B9 86 04
1569:15 F0 0A 18 69 80 99 06 A3
1571:07 C8 4C 67 15 A5 C5 C9 E5
1579:19 D0 03 4C 50 09 C9 27 EA
1581:D0 F3 4C FB 16 10 0C 01 64
1589:19 20 01 07 01 09 0E 3F 60
1591:00 12 13 9B 20 20 20 20 3E
1599:20 20 20 20 20 20 20 20 C3
15A1:CE 12 41 4D 45 3A 20 00 08
15A9:A0 00 8D BF 15 A9 12 20 65
15B1:D2 FF A9 1D 20 D2 FF C8 61
15B9:CC BF 15 90 F5 60 15 A0 E1
15C1:00 A9 A0 99 00 04 99 00 47
```

```
15C9:05 99 00 06 99 00 07 A9 C1
15D1:0F 99 00 D8 99 00 D9 99 91
15D9:00 DA 99 00 DB C8 D0 E1 73
15E1:60 00 08 10 18 20 28 30 FF
15E9:38 40 48 A0 00 8C F7 18 8D
15F1:A2 01 B9 09 19 DD 09 19 E0
15F9:90 08 F0 12 20 1F 16 4C A3
1601:F3 15 C8 E8 E0 09 90 EA 4B
1609:AD F7 18 D0 DE 60 B9 F9 FF
1611:18 DD F9 18 90 EC F0 EA 86
1619:20 1F 16 4C 03 16 B9 09 91
1621:19 48 BD 09 19 99 09 19 8E
1629:68 9D 09 19 B9 F9 18 48 D1
1631:BD F9 18 99 F9 18 68 9D F5
1639:F9 18 8C F5 18 8E F4 18 56
1641:B9 E2 15 A8 BD E2 15 AA 7E
1649:A9 00 8D F7 18 B9 29 19 8E
1651:48 BD 29 19 99 29 19 68 D3
1659:9D 29 19 E8 C8 EE F7 18 5A
1661:AD F7 18 C9 08 90 E6 AE 01
1669:F4 18 AC F5 18 A9 01 8D 02
1671:F7 18 60 53 30 3A 51 45 33
1679:57 42 2E 41 52 43 93 0D 8F
1681:20 20 20 20 20 20 20 20 AD
1689:20 73 41 56 45 20 54 48 CB
1691:49 53 20 50 45 52 46 4F 8F
1699:52 4D 41 4E 43 45 3F 0D 0A
16A1:20 28 73 43 52 41 54 43 0E
16A9:48 45 53 20 4F 4C 44 20 0C
16B1:20 71 45 57 42 20 41 4E CB
16B9:44 20 52 45 50 4C 41 43 28
16C1:45 53 20 49 54 2E 29 0D B8
16C9:20 20 20 20 20 20 20 20 F5
16D1:20 20 20 20 20 20 20 3C 1A
16D9:79 2F 6E 3E 00 A0 00 A5 68
16E1:C5 C9 40 D0 F8 B9 7F 16 3C
16E9:F0 06 20 D2 FF C8 D0 F5 FB
16F1:A5 C5 C9 40 F0 FA C9 19 BF
16F9:F0 0B 68 68 A9 00 85 C6 14
1701:A9 93 4C D2 FF A9 0D 20 80
1709:D2 FF A9 0F A2 08 A0 0F 4C
1711:20 BA FF A9 0B A2 74 A0 05
1719:16 20 BD FF 20 C0 FF A2 B8
1721:0F 20 C6 FF 20 E4 FF 20 6C
1729:D2 FF C9 0D D0 F6 20 D2 40
1731:FF A9 08 AA A8 20 BA FF B0
1739:A9 0A A2 75 A0 16 20 BD C5
1741:FF A9 E1 85 FB A9 18 85 AA
1749:FC A9 FB A2 99 A0 19 20 AB
1751:D8 FF A2 0F 20 C6 FF 20 6D
1759:E4 FF 20 D2 FF C9 0D D0 3D
1761:F6 A9 0D 20 D2 FF A9 08 0B
1769:20 C3 FF A9 0F 20 C3 FF B3
1771:20 CC FF A2 00 85 C6 60 11
1779:A9 0F A2 08 A0 0F 20 BA 51
1781:FF A9 00 A2 00 A0 00 20 E6
1789:BD FF 20 C0 FF A2 0F 20 6F
1791:C6 FF 20 E4 FF 20 D2 FF 9B
1799:C9 0D D0 F6 20 D2 FF A9 6F
17A1:08 AA A8 20 BA FF A9 0A C8
17A9:A2 75 A0 16 20 BD FF A9 9D
17B1:00 A2 E1 A0 18 20 D5 FF BB
17B9:A2 0F 20 C6 FF 20 E4 FF B7
17C1:20 D2 FF C9 0D D0 F6 A9 94
17C9:0D 20 D2 FF A9 08 20 C3 52
17D1:FF A9 0F 20 C3 FF 20 CC 79
17D9:FF A2 00 85 C6 60 93 0D F4
17E1:0D 0D 08 0E 1C 20 20 20 7D
17E9:20 20 20 20 20 71 71 20 FF
17F1:20 20 20 65 65 65 20 20 B3
17F9:77 20 77 20 77 20 20 62 BB
1801:62 62 0D 05 20 20 20 20 CE
1809:20 20 20 71 20 20 71 20 F0
1811:20 20 65 20 20 20 20 77 41
1819:20 77 20 77 20 20 62 20 19
1821:20 62 0D 1F 20 20 20 20 6F
1829:20 20 20 71 20 20 71 20 11
1831:20 20 65 65 20 20 20 77 B5
1839:20 77 20 77 20 20 62 62 7B
1841:62 0D 05 20 20 20 20 20 6A
1849:20 20 71 20 71 71 20 20 73
1851:20 65 20 20 20 20 77 20 81
1859:77 20 77 20 20 62 20 20 29
1861:62 0D 1C 20 20 20 20 20 6D
1869:20 20 20 71 71 20 71 20 DB
1871:20 65 65 65 20 20 20 77 47
1879:20 77 20 20 20 62 62 62 4F
1881:0D 0D 0D 0D 0D 0D 0D 0D B1
1889:0D 1E 63 4F 50 59 52 49 FE
1891:47 48 54 20 28 63 29 20 45
1899:31 39 38 39 20 63 6F 6D 26
18A1:70 75 74 65 21 20 70 55 0C
18A9:42 4C 49 43 41 54 49 4F A8
18B1:4E 53 00 00 A0 00 8C 20 1C
18B9:D0 8C 21 D0 B9 DF 17 F0 13
18C1:07 20 D2 FF C8 4C BD 18 E2
18C9:A2 00 A0 00 A9 08 8D B4 9C
18D1:18 CA D0 FD 88 D0 FA CE 07
18D9:B4 18 AD B4 18 D0 F2 60 B5
18E1:00 0A 00 01 0A 05 0F 0A 31
18E9:01 01 00 07 02 08 0B 01 92
18F1:00 01 00 07 06 00 00 FF 03
18F9:00 00 00 00 00 12 14 87 22
1901:8D 00 00 00 00 00 00 00 F9
1909:00 00 00 00 00 00 00 00 3B
1911:00 00 00 00 00 00 00 00 43
1919:20 20 20 20 20 20 20 20 4B
1921:00 00 00 00 00 00 00 00 53
1929:20 20 20 20 20 20 20 20 5B
1931:20 20 20 20 20 20 20 20 63
1939:20 20 20 20 20 20 20 20 6B
1941:20 20 20 20 20 20 20 20 73
1949:20 20 20 20 20 20 20 20 7B
1951:48 4F 42 42 53 20 20 20 63
1959:43 41 4C 56 49 4E 20 20 50
1961:42 49 4C 4C 20 43 41 54 3A
1969:4F 50 55 53 20 20 20 20 19
1971:20 20 20 20 20 20 20 20 A3
1979:20 20 20 20 20 20 20 20 AB
1981:20 20 20 20 20 20 20 20 B3
1989:20 20 20 20 20 20 20 20 BB
1991:20 20 20 20 20 20 20 20 C3
1999:00 00 00 00 00 00 00 00 CB
```

G

Looking for a Widget for your Printer and need it now? Call Precision!

Precision Images stocks a complete selection of parts, supplies, and manuals for these printers:

C. ITOH, QUME, CITIZEN, OKIDATA, FUJITSU, EPSON AND OTHERS

For Visa/MC/Amex Call
1-800-524-8338

Precision Images
P.O. Box 573
Chester, NY 10918

Circle Reader Service Number 195

Use the handy *Reader Service Card* in the back of the magazine to receive additional information on our advertisers.

GET MORE PLEASURE FROM THE BIBLE WITH **LANDMARK**

The Computer Reference Bible

Here's what LANDMARK will enable you to do:

- ✔ SEARCH THROUGH THE BIBLE—Find Phrases, words or sentences.
- ✔ DEVELOP TOPICAL FILES—Copy from the Bible text and search results then add your own comments and notes.
- ✔ COMPILE YOUR PERSONAL BIBLE—Outline texts in color. Add notes, comments, and references. Make your Bible Study organized and on permanent record!
- ✔ CREATE FILES— Convert them for wordprocessors like Paperclip and GEOS.
- ✔ MAKE SUPPLEMENTARY STUDY FILES— For more specific study and developing translation variations.

KJV or NIV ($10.00 royalty charge for NIV)

$119.95 plus $4.00 shipping in cont.. U.S.A. $7.50 Canada. Overseas write. BOTH KJV and NIV for $189.95 plus $10.00 NIV royalty and shipping charge.

v1.2 for **C64** and v2.0 for **C128**

CALL OR WRITE FOR A FREE BROCHURE

P.A.V.Y. Software P.O. Box 1584 Ballwin, MO 63022 (314) 527-4505

Circle Reader Service Number 192

COLOR RIBBONS & PAPER

RIBBONS: Red, Blue, Grn., Brwn., Purple, Yel.

Ribbons — Price Each	Black	Color	Heat Transfer
Brother M1109	4.95	5.95	7.00
C. Itoh Prowriter Jr.	7.00	9.00	–
Citizen 120D/180D	5.00	6.00	7.95
Commodore MPS 801	4.50	5.25	5.75
- MPS 802/1526	6.25	7.25	–
- MPS 803	4.95	5.95	7.00
- MPS 1000	3.95	4.95	6.75
- MPS 1200/1250	5.00	6.00	7.95
- 1525	6.50	8.00	–
Epson MX80/LX800	3.75	4.25	6.75
Okidata 82/92	1.75	2.25	4.50
Okidata 182/192	6.50	7.50	6.00
Panasonic K-XP 1080	6.75	7.75	–
Seikosha SP 800/1000	5.25	6.50	7.95
Star SG10	1.75	2.25	4.50
Star NX10/NL10	5.00	6.00	7.95
Star NX1000	4.50	5.50	6.75
Star NX1000C – 4C	–	8.75	–

T-SHIRT RIBBONS (Heat Transfer) – Red, Blue, Grn., Brwn., Purple, Yel., Blk. Call For Price & Availability.

COLOR PAPER

BRIGHT PACK—200 Sheets/50 each color: Red, Blue, Green, Yellow. 9 1/2 x 11 – $11.90/pk.

PASTEL PACK—200 Sheets/50 each color: Pink, Yellow, Blue, Ivory. 9 1/2 x 11 – $11.90/pk.

COLOR BANNER BAND PAPER – 45 ft./roll – $9.95/ea.

For ribbons & paper not listed above, call for price & avail. Price & spec. subject to change w/o notice. Min. order $25.00. Min. S&H $3.50 min. Visa, MC, COD.

RAMCO COMPUTER SUPPLIES
P.O. Box 475, Manteno, IL 60950 U.S.A.
(US) 800-522-6922 • (Canada) 800-621-5444
815-468-8081

Circle Reader Service Number 193

BRiWALL

SOLID PRODUCTS

P.O. Box 129/58 Noble Street
Kutztown, PA 19530

24 Hour FAX Line 1-215-683-8567
Customer Service 1-215-683-5433
Technical Support 1-215-683-5699

CALL

1-800-638-5757

Outside the USA (1-215-683-5433)

ACCESSORIES

Apro Extender 64 Cart Ribbon	$17
Apro Extender 64 User Ribbon	19
Aprospan 4 Slot Cartridge Holder	25
Blaster Auto Fire Module	5
Covers	call
Icontroller	16
Joysticks	call
Leroy's Cheat Sheets 64	3
Leroy's Cheat Sheets 128	7
Lightpen-Model 170c	69
Lightpen-Model 184c	39
Mach 128 Cartridge	35
Maxx Yoke Flight Cntrl	79
Monitor Cable - 64/128 40 Column	6
Monitor Cable 128 - 40/80 Switch	18
Monitor Cable 128 - Mono Video	6
Mouse 1351 Commodore C64/C128	40
Mouse M3 (1351 substitute)	39
Mousepad	8
Paper	call
Power Supply - C128 -Repairable	55
Power Supply - C64 -Repairable	39
Printer Intfce CardPrint	45
Printer Intfce G-Wiz	29
Printer Intfce Hot Shot Plus	69
Printer Intfce Super Graphic Senior	59
Printer Intfce Super Graphic Gold	89
Quick Brown Box 64K	105
QBB 64K upgrade (makes 128K)	115
RAM Expander 1750	179
RAM Expander 1764 (for C64)	135
RS232 Deluxe Interface	39
RS232 Interface FEMALE	39
Ribbon	cal
Ribbon Renew - Re-Ink w/no equip	5
Safeskin Keyboard Protector C128	19
Serial Cable - Serial 6 Foot	6
Serial Cable Splicer 6 pin DIN F/F	4
Serial to Serial Cable - 12 feet	8
Video RAM 64K Cartridge (FULL)	50
Warpspeed 128 / 64	35
Zoomer Console Controller	46

BOOKS

1541 Repair & Maint Handbook	$16
1541 Troubleshoot&Repair Guide	17
1571 Internals+	17
Anatomy of C64	17
Anatomy of the 1541	17
Basic 7.0 Internals	19
C128 Internals+	17
C128 Programmer's Ref Guide	20
C128 Tips & Tricks+	17
C128 Troubleshooting & Repair	17
C64 Tips & Tricks+	17
C64 Troubleshoot & Repair	17
CPM User's Guide	17
CSM Prog Protection Manual 1	24
CSM Prog Protection Manual 2	29
GEOS - How Get Most Book+Disk	9
GEOS Inside & Out+	17
GEOS Programmer's Ref Guide	17
GEOS Tips & Tricks Disk	10
How to Program in BASIC	24
K Jax Book Revealed 3	23
Lou Sanders Tricks & Tips	16
Machine Language 64+	13
Superbase The Book 64/128	15
Troubleshoot & Repair C64	18
Twin Cities 128 Compendium #1	15
+ means that a disk is available	12

GENERAL BUSINESS

Bankstreet Writer	$35
Business Form Shop	30
CMS Accounting/128	129
Chartpak 128	29
Datamanger 2 (64)	17
Fleet System 2+	39
Fleet System 4	52
Fontmaster 128 w/Speller	30
Fontmaster II	29
KFS Accountant 128	109
Leroy's Label Maker	24
Microlawyer	39
Paperclip 3 (NOT Publisher)	39
Paperclip Publisher	39
Partner 128	39
Partner 64	30
Personal Portfolio Manager 128	39
Personal Portfolio Manager 64	29
Pocket Dictionary 64/128	10
Pocket Filer 2	29
Pocket Planner 2	29
Pocket Superpak 2 (Digital)	67
Pocket Writer 2	39
Security Analyst 128	27
Superbase 128 - Version 3	39
Superbase 64	29
Superbase/Superscript/book128pack	69
Superbase/Superscript/book 64pack	59
Superscript 128	29
Swiftcalc 64 w/Sideways	17
Technical Analysis System 128	39
Vizistar 128	49
Vizwrite 128	45
Wordpro 128 w/ Speller w/ Filepro	30
Wordpro 64 w/speller & turbo load	30
Wordwriter 4 for C64	30
Write Stuff 128 W/ spellchecker	27
Write Stuff 64 w/ spellchecker	22
Write Stuff 64w/talk	24
Write Stuff spell checker only	10

EDUCATION

Calculus by Numeric Methods	$27
Designasaurus	22
Easy Sign	17
Ernie's Big Splash	9
Ernie's Magic Shapes	9
Evelyn Wood Dynamic Reader	17
Facemaker	16
Grandma's House	6
Jungle Book (Reading 2)	19
Kids on Keys	18
Kidwriter	22
Learn The Alphabet	6
Linkword:German	19
Linkword:French	19
Linkword:French 2	19
Linkword:Italian	19
Linkword:Russian	19
Linkword:Spanish	19
Mathbusters	6
Mavis Beacon Teaches Typing	30
Mental Blocks	10
Morse Code Trainer	5
Numbers Show (The)	10
Peter & Wolf Music	19
Peter Rabbit (Reading 1)	19
Reader Rabbit	26
Rocky's Boots	23
SAT Complete (Hayden SAT Prep)	26
Sesame Street Library Vol 1	19
Sky Travel	33
Stickybear ABC'S	27
Stickybear Math 1	27
Stickybear Math 2	27
Stickybear Numbers	27
Stickybear Reading 1	27
Stickybear Reading Comprehension	27
Stickybear Spellgrabber	37
Stickybear Townbuilder	27
Stickybear Typing	37
Where Europe is Carmen Sandiego	27
Where in USA is Carmen Sandiego	27
Where World is Carmen Sandiego	25
Widham Classics - Alice Wonderla	12
Widham Classics - Below the Root	12
Widham Classics - Swiss Family R	12
Widham Classics - Treasure Island	12
Widham Classics - Wizard of OZ	12

ENTERTAINMENT

AD&D - Dungeon Master Assis.	$22
AD&D - Heroes of the Lance	22
AD&D - Pool of Radiance	27
Ad&D - Curse of the Azure Bonds	27
After Burner	23
Arcade Mega Hits	23
Aussie Games	20
Batman	19
Battle Chess	29
Beyond Dark Castle	20
Beyond the Black Hole	20
C64 Games Spectacular Package	21
California Raisins	19
Captain Fizz	20
Caveman Ugh*lympics	21
Chessmaster 2100	25
Christmas Classics	7
Chutes and Ladders	12

Waiting for a new release?

Why not **pre-order** it! We'll take your order **now**, and ship the product as soon as we receive it!

You can even call us **Toll-Free** to check on the status!

Clue: Master Detective*	22
Death Bringer	22
Dragon Wars*	30
Dr. Doom's Revenge	23
F14 Tom Cat	27
Face Off!*	20
Galactic Frontier	12
Gauntlet 2	20
Great War	15
Hole In One - Miniature Golf	20
Hostage	20
Jeopardy 2	12
Jordan vs Bird	22
King of Chicago	12
King of the Beach Volleyball	22
Licence to Kill	13
M.A.C.H.	18
Monopoly C64	20
Neuromancer	27
Omega	33
Out Run	27
Risk C64	27
Rocket Ranger	23
Roger Rabbit	22
SDI	12
Scrabble	21
Sex Vixens From Space	20
Shanghai	14
Sim City	20
Snow Strike	23
Super Password	12
TV Sports Football	24
Three Stooges	23
Thud Ridge	24
Tom & Jerry	16
Torchbearer	12
Ultima Trilogy (1,2,3)	39
Wheel & Deal 128	24
Windwalker	27
Wizardry Trilogy	26
Zach Macrakin	25

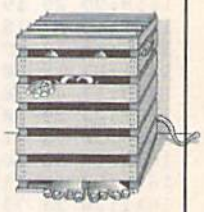
GEOS RELATED

Becker Basic for GEOS 64	$35
Desk Pak Plus - Geos	22
FontPak Plus -GEOS	22
GEOS 64 v 2.0	39
GEOS Programmer	45
Geocalc 128	45
Geocalc/64	35
Geochart/64	22
Geofile 128	45
Geofile/64	35
Geopublish 64	39
Geos 128 V2.0	45

CREATIVITY/GRAPHICS

Animation Station	$65
Award Maker Plus	29
Award Ware	12
Billboard Maker	25
Blazzing Paddles	25
Bumpersticker Maker	35
Business Card Maker	29
Button & Badge Maker	33
Cad 3D	39
Cadpak 128	39
Cadpak/64	29
Certificate Maker - Library Disk	12
Colorez 128	12
Computer Eyes	105
Doodle	29
Flexidraw 5.5	29
Flexifont	24
Graphics Art Disk #1-8 each	13
Graphics Galleria Pak 1	24
Graphics Galleria Pak 2	24
Graphics Intergrator 2	24
Home Designer	45
Home Designer Circuit Symbol Lib	10
Icon Factory	25
Label Wizard	21
Newsmaker 128	24
Newsroom	14
Newsroom Clip Art 1,2,3 each	13
PC Board Maker 64	79
Photo Finish	19
Poster Maker 128	24
Printmaster Gallery I	15
Printmaster Gallery II	15
Printmaster Plus	25
Printshop	30
Printshop Companion	27
Screen F/X	25
Sketchpad 128	24
Slideshow Creator	13
Spectrum 128	29
Video Title Shop w/ Gr Comp 1	25

WHY CHOOSE BRIWALL?



- ✓No Surcharge on Charge Orders
- ✓24-Hour Toll-Free Ordering
- ✓Our Fifth Year in Business
- ✓Fast, Friendly, Reliable Service
- ✓In-house Technical Support
- ✓A Fair Return/Exchange Policy
- ✓A "No-surprises" Shipping Policy

YOUR SATISFACTION IS GUARANTEED!

PERSONAL

Bible Search	$20
Bridge 5.0	20
Celebrity Cookbook	19
Dr. Ruth's Book of Good Sex	22
Family Tree C64/C128 and LDS	39
Fun Biorythms	5
Recipe Filer	11
Sexual Edge	19
Tarot 128	15

UTILITES/LANGUAGES

1541/1571 Drive Alignment	$25
1581 Toolkit V2/ Dos Ref	29
Assembler/Monitor	29
Basic 8	29
Basic 8 Toolkit	17
Basic 8-How to Get the Most Out of	17
Basic 8/Toolkit/Book Package	45
Basic Compiler/128	39
Basic Compiler/64	29
Big Blue Reader 64/128	32
Bobsterm Pro/128	42
Bobsterm Pro/64	35
C128 Advanced User Package	45
C128 Programmer's Delight	45
CP/M Kit	22
CSM Newsletter Compemdium	29
Cobol/128	29
Cobol/64	29
Digitalker 128	20
Gnome Kit 64/128	29
Kracker Jax Super Cat	22
Kracker Jax Vol 1- 7 + Shotgun2	27
Maverick V4.0 Copier	29
Merlin 128	45
Merlin 64	35
Physical Exam 1541/1571	29
Power Assembler 64/128	30
Power C 64/128	30
Programmers Toolbox	15
Protolinc BBS 128	29
Prototerm 128	12
Super 64 Librarian	19
Super 81 Utilities for C128	29
Super 81 Utilities for C64	29
Super Aide 64	25
Super C 128	45
Super C 64	45
Super Disk Librarian for C128	19
Super Disk Utilities 128	25
Super Pascal 128	45
Super Pascal 64	45
Super Snapshot V4	59
Super Snapshot V4 w/128 Disable	65
SysRES Enhanced	16

LOOKING FOR SOMETHING NEW FOR YOUR COMPUTER?

Here are some of our currently popular titles:

1541/1571 Drive Alignment
Home Designer
Aprospan 4 Slot Cartridge Holder
Basic 8
Newsmaker 128
Maverick V4.0 Copier
Geos 128 V2.0
Sketchpad 128
Mouse M3 (1351 substitute)
Family Tree C64/C128 and LDS
Write Stuff 128 W/spellchecker
Basic 8 Toolkit
Newsroom
RAM Expander 1750
Big Blue Reader 64/128
Super Snapshot V4 w/128 Disable
CP/M Kit
Superbase 128 - Version 3
Cad 3D/64
SAT Complete
Ultima Trilogy (1,2,3)

We maintain an enormous inventory of software. If you don't see what you want, CALL!

Titles marked with * were not yet available when the ad was prepared. Please call for firm price and availablilty. Titles in BOLD are new items

Australian Customers can order locally from Briwall Australia at: (062) 88 0131, or FAX (062) 88 0337

SOLID SUPPORT

CALL

1-800-638-5757

Outside the USA (1-215-683-5433)

BRiWALL

P.O. Box 129/58 Noble Street
Kutztown, PA 19530

VISA

PLEASE COME VISIT US!
Monday - Friday 9AM-6PM EST
Saturday 9AM-12 Noon EST

MasterCard

WHERE CAN YOU FIND PROGRAMS MADE JUST FOR YOUR 128?

CHECK US OUT! WE HAVE WHAT YOU NEED!

For Desktop Publishing? Try

NEWS MAKER 128

Desktop publishing for the 128D (or the 128 with 64K video RAM upgrade). News Maker 128 can be used to create professional looking newsletters, reports, signs and posters. It can be used as a stand-alone program or in combination with word processing or graphics software. It uses standard sequential files for "pouring" text into user-defined columns. Full page layout, pop-down menus, smooth screen scrolling, font selection, a note pad, freehand drawing, pixel edit, REU support, and a sideways printing utility are among the many features available.

ONLY $24

Graphics? Try

SKETCHPAD 128

Complete drawing system for the Commodore 128 and 1351 mouse. Sketchpad takes advantage of the 80 column graphics of the 128. A 640X200 drawing screen, smooth freehand drawing, wide selection of brushes and many fonts are provided.
JUST $24

SPECTRUM 128

If you have a 128D (or 128 with 64K video RAM upgrade) you can take full advantage of this 80-column paint package with 128 colors! Menu operated. Mouse required. Features include airbrush, mirror, multi-color, block fills, pixel edit, color edit, fonts, and a slideshow maker.
ONLY $29

The Ultimate CAD Package? Try

HOME DESIGNER 128

Given glowing reviews by every major Commodore magazine, this CAD system out-classes every other CAD program because of its object oriented design. With over 50 powerful commands, 5 layers, superb support of library figures and laser-quality printouts at ANY scale on your dot matrix printer or plotter, you can create drawings so accurate that a blueprint can be made from them
!
Tired of working with poor quality/inaccurate printouts, manipulating little dots on a bit-map, giving up on detailed work because you can't zoom in close enough? Join the professionals!

OUR PRICE ONLY $45

THREE COMMODORE 128 PACKAGES

We've assembled three packages of Commodore 128 specific software at great savings. These packages contain more 128 software than you probably thought was available.

YOUR CHOICE $45

#1) 80-Column Fun-N-Games - Five programs designed specifically for the 128 80-column mode!
Try to make $100,000 with **Wheel & Deal**, play a talking puzzle with **Digitalker 128**, determine your destiny with **Tarot 128**, test your ESP abilities with **ESP Tester**, and improve your memory skills with **Memory Academy 128.**

#2) Programmer's Delight - Five 128 programs that will bring out the programmer in you.
You get **Gnomespeed**, a 128 BASIC compiler, **Colorez**, to convert 40-column graphics to 80-column, **Digitalker 128**, for adding digitized voice to your programs, **Super Disk Librarian**, for cataloging all of your disks, and **Super Disk Utilities**, for all your file handling and disk editing **needs.**

#3) Advanced User - Five 128 programs to get the most out of your 128 system and peripherals.
You get **Prototerm**, a terminal package, **Protolinc BBS**, a BBS package, **Digitalker**, for adding digitized voice to your 128 programs, **Super 81 Utilities**, a disk editing and file utility package specifically for the 1581, and **Colorez**, the 40 to 80 column conversion program.

1541/1571 DRIVE ALIGNMENT

This excellent alignment program is a must-have for every Commodore owner. Easy to use, it helps you to align your drive so that it runs just as if it were new! The simple instructional manual and on-screen help prompt you through the alignment procedure and help you adjust the speed and head stop of your drives. It even includes instructions on how to load the alignment program when nothing else will load!

Don;t be caught short! We get more Red Label orders for this program than any other program we sell. Save yourself the expense! Order now, keep it in your library, and use it often!

Works on the 64, 128 and SX64 for the 1541, 1571, 1541-II and compatible third party drives.

STILL ONLY $25

BASIC 8 Package

Now get an entire Basic 8 programming library for the price of an average piece of software!

The Basic 8 package includes: **Basic 8**, the powerful 80-column graphics programming system for the Commodore 128, adding over 50 commands to standard BASIC 7.0, and including Basic Paint, Basic Write and Basic Calc; **Basic 8 Toolkit**, a point-and-click operating system that allows you to create custom pointers, fonts, patterns and icons; and **How To Get The Most Out Of Basic 8**, a book and disk combination that provides dozens of examples, two full disks of demos and a 3D animation system.

The list price of the individual pieces is $79.95

OUR PACKAGE PRICE $45!

Games Spectacular Package

Whether you are new to Commodore computers, or just looking to expand your software library, you can't afford to miss this deal!

You get a total of 10 games for less than the price of many single titles! This package includes: **Galactic Frontier**, a graphic, space exploration game where your mission is to find new life forms; **Torchbearer**, a role-playing, graphic adventure game; **Revenge of the Moon Goddess**, a collection of four adventure games; and **Eye of the Inca** a second collection of four adventure games.

Ten games in all, with a total suggested list price of $90.

OUR PACKAGE PRICE $21!

SHIPPING POLICY: ALL ORDERS received before 3PM EST will normally be shipped within 2 business days. All UPS shipments are sent Signature Required/No Driver Release. Add the following shipping charges to your Total software order.

UPS: Ground $4.50 (cont. USA ONLY); Air/Rush $8.00 (includes Puerto Rico/Hawaii); Overnight $12.00 + $2.50 PER ITEM (must be received by 12 Noon.) **Priority Mail**: USA $4.50 (Includes APO/FPO); Canada/Mexico $7.00; Other Foreign $4.00 Handling + Actual Shipping + Insurance.

HARDWARE: Shipping charges for all hardware are $4.50 handling + actual shipping charges + insurance.

ORDERING INSTRUCTIONS: For your convenience, you can place a phone order 24 HOURS/7 DAYS A WEEK on our TOLL-FREE LINE 1-800-638-5757. Outside the USA, please use (215) 683-5433. Price, availability, and compatibility checks are also welcome on our order line, Monday thru Friday, 9:30AM - 4:30PM EST. AFTER HOURS Orders Only Please! When placing an order, please specify your computer model, home & daytime telephone number, shipping address, charge card number, expiration date and name of bank.

ACCEPTED PAYMENT METHODS: We gladly accept Personal Checks (no holding), Money Orders, VISA, MASTERCARD, School Purchase Orders, or COD ($4.00 additional -- for established Briwall Customers ONLY). All checks must be in US Dollars and drawn on a US bank. There is no surcharge for credit cards and your card is not charged until we ship!

RETURN POLICY (for software and accessories ONLY): We have a liberal return policy to better service your needs. If within 15 days from the time you receive an item, you are not satisfied with it for any reason, you may return it to us for either a refund, exchange, or open credit. REFUNDS ARE SUBJECT TO A 10% RESTOCKING FEE PER ITEM RETURNED ($5.00 MINIMUM PER ITEM.) EXCHANGES/OPEN CREDITS will gladly be issued for the full purchase price of the item. DEFECTIVE items, Hardware items and Special Order items will be repaired or replaced with the same item only.

TECHNICAL SUPPORT Call (215) 683-5699, Monday - Friday, 9am - 5pm EST.
We do our very best to help you with your product selections before you order, and after you receive your product. General questions, such as price, compatibility, etc.. will be handled by our order staff at the time you place your order. BUT, if you have specific, detailed questions about a product you will get the most help from our Technical Support Line.

PINHEAD

James Merlo

Quick reflexes are what you'll need to master this fast-paced, arcade-style game for the 64. Game paddles or joystick required.

The circus is in town. The show's about to begin. But wait, where did all those balloons come from? They're floating around the top of the tent and you—a lowly clown—have been elected to get them down.

Suddenly, you have an idea. You insert a straight pin through your cap and climb onto a trampoline. You begin to bounce. There's a balloon directly overhead. Just maybe. . . . Now, one big jump. Wham! You just scored in *Pinhead*.

Pinhead is an addictive, fast-action game written entirely in machine language. The object of this game is to pop as many balloons as you can using a clown that you bounce from a trampoline. As the game proceeds, the balloons and the clown move ever faster, ultimately reaching a frenetic pace.

Getting Started

Since *Pinhead* is written in machine language, you'll need to type it in using *MLX*, the machine language entry program found elsewhere in this issue. When *MLX* prompts you, respond with the values given below.

Starting address 0801
Ending address 17C0

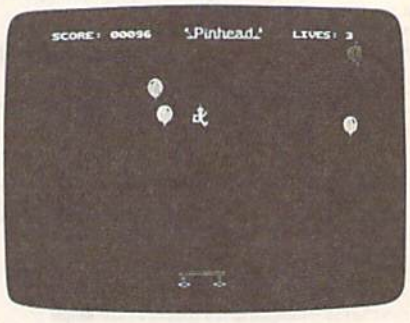
When you've finished typing in the program, be sure to save a copy of it before exiting *MLX*.

Pinhead loads and runs like a BASIC program. When you're ready to play, plug a set of game paddles into port 1 or a joystick into port 2. Then load the program and type RUN. For a paddle-controlled game (the default), press f1; for joystick control, press f3.

Point of Attack

When the game begins, your clown stands poised on a trampoline at the bottom of the screen. Your score and the number of clowns remaining (four) are indicated at the top. After a moment, balloons begin to drift across the screen. Pick out a balloon to pop and use the game paddles or the joystick to maneuver the trampoline under it. Then, when you're ready, press the fire button to launch the clown from the trampoline.

If you strike the target balloon at an angle, the clown will change direction. Position the trampoline beneath the descending clown. The closer the clown is to the center of the trampoline when it lands, the higher it bounces. To give the trampoline extra spring, hold down the fire button. If the bouncing clown misses the trampoline and hits the ground, you lose a life.



Acrophobics beware! You'll soar to dizzying heights to pop these balloons.

Scoring is based on the size and speed of the balloons you pop. The smaller and faster a balloon is, the more points you receive for popping it. Also, you're awarded an extra life every 2000 points.

As the game progresses, the clown and balloons move faster. Once you've scored 300 points, the clown speeds up. At 500 points, the balloons start moving faster. At the 1500-point mark, the clown speeds up again. The last increase occurs at the 2000-point barrier, when the balloons reach maximum speed.

The game ends when you no long-

er have any clowns. To start a new game, press the fire button. **G**

Pinhead

```
0801:0E 08 25 00 9E 32 30 36 13
0809:34 20 20 20 00 00 00 AD EE
0811:11 D0 29 EF 8D 11 D0 78 CC
0819:A9 34 85 01 A0 C4 B9 3C 93
0821:08 99 F8 00 E0 83 B0 06 37
0829:B9 E7 08 99 33 03 88 D0 32
0831:ED A9 64 85 2D A9 41 85 9F
0839:2E 4C 00 01 10 F0 07 63 39
0841:59 4A 16 B9 58 09 99 E8 F1
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0E 20 34 03 85 5D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 19 A0 02 03
0899:D0 1D 85 A6 18 A5 FC 65 2B
08A1:A6 85 F7 A5 FD 65 A7 85 1A
08A9:F8 20 6C 03 4C 13 01 E8 95
08B1:20 34 03 D0 0B A0 03 84 B1
08B9:A8 A2 08 20 34 03 D0 DA F3
08C1:E8 20 34 03 D0 0A E8 20 A5
08C9:34 03 18 69 04 A8 D0 E7 9A
08D1:E8 20 34 03 D0 0A A2 02 0B
08D9:20 34 03 18 69 06 D0 ED DB
08E1:A2 08 20 34 03 D0 E6 A9 5F
08E9:00 85 A7 A4 FB F0 0C 06 5C
08F1:FA 2A 26 A7 C6 FB CA D0 D5
08F9:F2 A8 60 48 B1 FE 85 FA CD
0901:A9 08 85 FB 68 A4 FE D0 FE
0909:02 C6 FF C6 FE C0 E7 D0 D5
0911:DE A4 FF C0 07 D0 D8 A9 9E
0919:37 85 01 58 4C 00 50 A4 75
0921:A8 F0 22 A5 F7 38 E5 A8 77
0929:B0 03 C6 F8 38 85 F7 A5 2A
0931:FC E5 A8 B0 02 C6 FD 85 08
0939:FC B1 F7 88 91 FC 98 D0 40
0941:F8 C4 A9 F0 0A B1 F7 C6 13
0949:FD C6 F8 C6 A9 10 EC E6 E5
0951:01 EA EA EA C6 01 60 00 A5
0959:C2 78 A0 30 0A FF FF FF 52
0961:AA AA AA 74 01 0E 01 F1 44
0969:73 F1 68 95 78 64 00 02 6F
0971:91 4C 0B B8 00 2E 2E 82 E3
0979:B8 3B EB EC 32 BE 8C 30 D8
0981:28 0C 4B AF 0C 93 07 81 4D
0989:20 04 74 00 1D 10 00 04 68
0991:FF 04 FF B9 60 F8 FC C0 E1
0999:3F E3 A7 F1 AF 63 30 03 C6
09A1:C1 E0 F7 07 FE 56 1E 96 60
09A9:20 CC 10 1C 90 22 37 F0 2F
09B1:06 5B 03 91 21 01 19 7E D4
09B9:78 FC 6D 07 7C 7E 18 02 75
09C1:00 06 0A 07 F6 86 0C 03 F3
09C9:E4 01 47 7E 00 A4 05 80 7C
09D1:1E 1E 3F 12 8F 25 51 24 5B
09D9:7E 44 0E 63 86 21 D8 33 D1
09E1:30 00 31 E0 00 30 E0 27 E9
09E9:40 0F F1 F8 69 78 20 E3 FE
09F1:C8 81 45 FF 80 55 C4 10 64
09F9:1C 30 42 06 66 AC 1C C6 B3
0A01:99 86 91 01 07 F9 D1 00 89
0A09:F8 FC 01 02 44 C1 92 28 8F
0A11:12 3F 22 47 CC 01 9C D0 2B
0A19:09 08 ED F8 01 79 14 BE D5
0A21:8B DC 80 44 37 7E 1F CC 45
0A29:1D 82 44 1C 48 36 60 0B 9D
0A31:15 30 04 36 CC F7 80 84 8B
0A39:80 4C C3 83 0D 87 99 70 7B
0A41:03 49 60 01 BE C0 00 DD 1C
0A49:10 EE A4 F0 10 06 1C 30 C5
0A51:07 F7 F0 00 00 00 00 00 05
0A59:00 00 00 00 00 00 00 00 6D
0A61:00 00 00 00 00 00 00 00 75
0A69:00 00 00 00 00 00 00 50 CD
0A71:04 F8 9C 89 47 84 79 59 8A
0A79:80 79 F8 57 3E F8 F0 4F C7
0A81:3C 7E 28 1E 1A 22 01 42 D7
0A89:F8 00 5E 08 03 FF 80 01 80
0A91:FF 00 00 FE 18 FE D3 F8 F2
0A99:8F 78 FC 38 3C 66 19 1E 82
0AA1:76 07 FC 24 CC F8 55 78 02
0AA9:6C 82 B0 C4 E3 67 E1 71 E8
0AB1:22 3A C4 85 CF 71 9F 10 E9
0AB9:38 BF 11 10 36 42 48 64 AC
0AC1:7E 00 00 3C 00 00 18 00 09
0AC9:00 18 F4 F8 4F C5 43 45 6F
0AD1:80 08 0D F9 13 FC 21 51 89
0AD9:A2 80 21 20 16 19 02 E2 81
0AE1:07 0A 31 1E 28 42 A6 7C 18
0AE9:00 D5 03 3F 80 06 7F C0 A3
0AF1:06 21 F8 2C 43 E0 C0 20 72
0AF9:E0 8A 80 B0 81 16 FF 80 21
0B01:01 FF 00 00 FE 00 00 38 C7
0B09:00 00 10 00 00 10 E9 42 77
0B11:12 00 00 00 00 00 5F 10 FE
0B19:A1 03 FC A1 22 FE 60 48 90
0B21:70 40 04 84 80 68 11 02 12
0B29:03 FF E0 4E E8 E2 91 B3 6B
0B31:3E 47 C0 DB 68 0E 7F F8 81
0B39:0C 48 07 1D 29 68 08 88 9D
0B41:7F 1C FC 07 C6 03 6C E1 2B
0B49:07 F2 27 1E 3C 3A 34 38 D1
0B51:44 9C 40 1C CC A4 00 47 BA
0B59:D1 0E A1 8E 7E CF 95 C0 18
0B61:31 1C 31 20 39 A2 73 21 9B
0B69:02 77 E2 00 05 38 04 04 CF
0B71:2D CC FE 9A 56 80 FC 33 BC
0B79:76 F8 62 F0 27 2A C0 22 E9
0B81:09 02 3C 22 20 04 18 24 AB
0B89:47 E2 01 8B F3 C7 F9 41 C8
0B91:F2 15 1E C8 0A 7C 9F E2 1B
0B99:87 87 0D C3 03 04 34 0E D1
0BA1:3F F8 18 A4 03 14 E0 10 1D
0BA9:10 42 38 EC F8 E5 E0 00 4F
0BB1:7F CC 84 24 1E F7 0A 8F 02
0BB9:25 F0 73 1C 21 11 C6 52 FB
0BC1:80 43 40 08 7F FF FF 3F AC
0BC9:FF FE 1F FF FC 28 DE F0 BA
0BD1:22 F0 0C 6F D1 2E 9E 71 A3
0BD9:00 E6 A8 11 2F 01 9F 64 F0
0BE1:3F 22 48 7F 72 91 A3 00 42
0BE9:87 80 10 10 82 38 6C 18 CC
0BF1:1E 76 11 8F 34 F6 33 F2 A6
0BF9:22 02 FB 72 91 A3 00 87 EA
0C01:80 10 10 30 42 40 08 01 86
0C09:98 29 21 20 72 7C 4C 0E 0A
0C11:C4 A3 6D E1 A1 01 14 06 7F
0C19:7F C0 0C B2 A0 21 0F FF 75
0C21:E0 07 FF C0 03 20 F8 8C 8E
0C29:30 38 36 02 42 10 40 7A 9B
0C31:14 FF 3E 45 27 00 36 00 15
0C39:06 63 30 03 C1 E0 01 80 77
0C41:4F DE 02 45 33 0F 01 F1 17
0C49:0C 36 18 0F E3 F8 A3 8B BE
0C51:56 1E 85 1C 1C A1 00 1C 12
0C59:00 7C 3F 29 0F 64 86 49 6B
0C61:8F 3E 90 08 9C C0 00 FF 4B
0C69:80 30 1C 06 09 FF 61 79 36
0C71:08 2D 03 49 60 01 BE C0 13
0C79:30 FF 86 BC F8 8F CE 06 EF
0C81:7F 30 33 FF E6 FB E7 E5 A8
0C89:21 A4 00 3E 2B 7F 41 FE 18
0C91:6C 1E 42 01 FF C0 FA 7E 37
0C99:70 1E 02 42 00 08 00 C0 B6
0CA1:04 3F FF FE 9C FF FF C3 24
0CA9:FF FF E1 FF FF F0 FF 7F 41
0CB1:F8 FF 3F FC FF 1F AD AE 84
0CB9:0F AB AB 00 00 00 00 00 B9
0CC1:EF FF D4 E3 FE 4D BE 72 C7
0CC9:B4 89 BF 46 7E 91 3C 2C D9
0CD1:FE C0 F8 FC 6E 1A 0C 7C F8
0CD9:C0 CE FA 7E 1A 47 3B AE 60
0CE1:C4 13 83 0C E2 11 00 20 CD
0CE9:FE 72 EE FE D6 E0 0E 1A 5C
0CF1:0F 60 00 00 00 7C 20 5F 3B
0CF9:72 3C C0 C0 A8 97 85 FC 2A
0D01:C6 FC CC C6 6F 34 C0 7C 0E
0D09:EB BF FC 73 30 6E 0E C6 FD
0D11:F0 5C C6 C6 C6 6C 38 00 58
0D19:00 00 00 00 00 00 00 00 33
0D21:00 00 00 00 00 00 00 00 3B
0D29:00 00 00 00 00 00 00 00 43
0D31:00 00 00 00 00 00 33 09 BA
0D39:F0 FF 96 7E 1F B4 8A 7C E3
0D41:CE D6 E6 E7 0B F0 30 30 80
0D49:30 F3 81 71 00 1D FE 72 A4
0D51:20 22 3C E4 A1 CC CC FE B2
0D59:0C 0C FB C0 38 06 FC A0 7C
0D61:07 C0 FC D6 43 FE C6 0C EB
0D69:18 30 F7 A0 51 00 07 7C B9
0D71:C6 7E 06 7C 5C 03 46 18 AA
0D79:80 F8 FF 00 00 00 00 00 12
0D81:00 00 00 00 00 00 00 00 9B
0D89:00 00 00 00 00 00 00 00 A3
0D91:00 00 00 00 00 00 00 00 AB
0D99:00 00 00 00 00 00 00 00 B3
0DA1:00 00 00 00 00 00 00 00 BB
0DA9:00 00 00 00 00 00 00 00 C3
0DB1:00 00 00 00 00 00 00 00 CB
0DB9:00 00 00 00 00 00 00 00 D3
0DC1:00 00 00 00 00 00 00 00 DB
0DC9:00 00 00 00 00 00 00 00 E3
0DD1:00 00 00 00 00 00 00 00 EB
0DD9:00 00 00 00 00 00 00 00 F3
0DE1:00 00 00 00 00 00 00 00 FB
0DE9:00 00 00 00 00 00 00 00 04
0DF1:00 00 00 00 00 00 FF 1E 2A
0DF9:F0 FF B0 30 70 70 08 04 FE
0E01:02 01 1F 1F 3E 18 1F A0 65
0E09:64 C0 66 60 66 C6 06 06 BA
0E11:07 0C 7F 7E 90 00 63 E1 B8
0E19:30 30 3F B0 00 31 31 F1 65
0E21:3B 0F 98 9F 98 B8 EF E0 14
0E29:03 8F C0 C7 0C 1C F7 BE BE
0E31:C1 63 E3 63 77 DD 60 01 AE
0E39:F8 09 18 18 F7 0C 0E 0E B2
0E41:10 20 40 80 F8 40 EE FF 24
0E49:FF 20 2E 7E A8 17 70 7F 1D
0E51:1E 89 E4 81 58 88 88 57 E0
0E59:3E 2F 0F F8 80 F0 09 89 35
0E61:72 02 40 4E 91 8E 11 11 1E
0E69:0E CE 0F 38 44 44 3C 04 55
0E71:38 D8 5F FB 3E 08 08 48 F5
0E79:30 7B 72 8B FA 8A 8A 60 0B
0E81:0F 20 62 A7 22 20 EC 81 E0
0E89:3B 42 43 42 3A 3D 91 5B A5
0E91:95 11 11 B0 FE FF 0F FF FF
0E99:FF 87 FF FF C3 FF FF E1 97
0EA1:FF FF F0 FF 7F F8 FF 3F FA
0EA9:06 09 1F 41 42 0F 90 90 03
0EB1:07 44 C4 E3 40 C7 00 23 7D
0EB9:00 00 00 DA CE C3 B9 B0 2D
0EC1:A8 A0 99 92 8B 85 7F 79 A1
0EC9:73 6E C0 FA 61 5D 59 55 8B
0ED1:52 4F 4C 49 46 44 42 40 11
0ED9:3F 3E 3D 3C 3C 3D 3E 3F 23
0EE1:40 42 44 46 49 4C 4F 52 08
0EE9:55 59 5D 61 11 10 E0 83 D6
0EF1:6E 73 79 7F 85 8B 92 99 62
0EF9:A0 A8 B0 B9 C3 CE 9C 1B EF
0F01:D0 C8 C0 B9 B2 D9 23 9F 50
0F09:99 94 8F 8A 85 81 7D 79 5A
0F11:75 71 6D 69 65 62 5F 5C 5A
0F19:5A 58 56 54 52 50 4F 4E 4B
0F21:4D 4C 4C 4D 4E 4F 50 52 F9
0F29:54 56 58 5A 5C 5F 62 65 42
0F31:69 6D 71 75 79 7D 81 85 2F
0F39:8A 8F 94 99 9F 36 C0 FF 04
0F41:B2 B9 C0 C8 D0 68 1D BD EB
0F49:B7 B1 AB A5 A0 9B 96 91 B1
0F51:8C 3E FE 7B 77 74 71 6E BB
0F59:6B 69 67 65 63 61 60 5F 8B
0F61:5E 5D 5D 5E 5F 60 61 63 3A
0F69:65 67 69 6B 6E 71 74 77 91
0F71:7B A3 07 F0 35 8C 91 96 BB
0F79:9B A0 A5 AB B1 B7 BD 8E 73
0F81:97 E1 D1 C9 C1 BA B3 AC C7
0F89:A6 A0 9A 95 90 8B 87 83 15
0F91:7F 7C 79 76 74 72 70 6F E2
0F99:6E 6D 6C 6C 6D 6E 6F 70 13
0FA1:72 74 76 79 7C 7F 83 87 EC
0FA9:8B 90 95 9A A0 A6 AC B3 BA
0FB1:BA C1 C9 D1 32 C0 C3 D2 E2
0FB9:CB C4 BE B8 B2 AD A8 A3 93
0FC1:9F 9B 97 93 90 8D 8A 87 1A
0FC9:85 83 81 80 7F 7E 7E 7F 36
```

```
0FD1:80 81 83 85 87 8A 8D 90 6B
0FD9:93 97 9B 9F A3 A8 AD B2 E2
0FE1:B8 BE C4 CB D2 E8 02 3C DB
0FE9:8B D3 CD C7 C2 BD B8 B4 2C
0FF1:B0 AC A8 A5 A2 9F 9C 9A 6A
0FF9:98 96 95 94 93 92 92 93 A5
1001:94 95 96 98 9A 9C 9F A2 56
1009:A5 A8 AC B0 B4 B8 BD C2 8D
1011:C7 CD D3 2A C0 8B D4 CF 53
1019:CA C5 C1 BD B9 B5 B2 AF DD
1021:AC AA A8 A7 A6 A5 A5 A6 8F
1029:A7 A8 AA AC AF B2 B5 B9 D4
1031:BD C1 C5 CA CF D4 08 02 E9
1039:3C DA D5 D1 CD CA C7 C4 F3
1041:C2 C0 BE BC BB BA B9 B8 8B
1049:B7 B7 B8 B9 BA BB BC BE E2
1051:C0 C2 C4 C7 CA CD D1 D5 9E
1059:DA FF 88 10 E0 FD FF 1F 17
1061:FE FF 0F FF FF 87 FF FF 01
1069:C3 FF FF E1 FF FF F0 FF 6B
1071:7F F8 FF 3F FC FF 1F FE A8
1079:FF 0F FF FF 87 FF FF C3 5D
1081:FF FF 41 5B FB D0 DA 7A D2
1089:B0 B4 3C 2C 2E 1E 0A 0B 82
1091:8F 02 1C 02 00 00 00 EE 8C
1099:20 C2 D8 21 D0 78 A9 7F E2
10A1:8D 0D DC 08 E7 1A 32 04 F7
10A9:1B 8D 11 A6 C4 12 29 39 41
10B1:8D 14 32 4D 50 D9 03 91 3A
10B9:5E 1D 09 D0 4C 2D 50 68 9E
10C1:A8 68 AA 68 40 4C C7 50 3F
10C9:64 DE 08 2B 19 52 EF AD 27
10D1:40 04 70 EE C4 58 20 44 1C
10D9:E5 C1 C2 02 59 8A 04 40 13
10E1:2C 9D 00 D8 0C 0D 4C F0 2B
10E9:A9 03 8D 15 F4 00 96 80 F7
10F1:8D 17 99 26 1C 38 04 AC AA
10F9:E2 A9 E1 AD FE 80 06 8D A0
1101:27 C0 0E 20 28 50 96 1D 77
1109:84 DA 8D 03 C0 08 02 A4 D4
1111:D0 A9 0C 8D 25 D0 8F 41 2D
1119:8E F8 07 E8 E8 8E F9 07 AC
1121:A9 80 8D 12 94 13 FF 8D 89
1129:0E 18 01 D8 18 D4 50 91 4C
1131:04 A9 05 D4 A2 80 8A 50 2A
1139:02 03 A9 0D 9D 91 D7 A6 AC
1141:8A D0 F2 AD 19 D4 8D 02 4F
1149:BE AD 1E 4C 80 F3 A2 00 D7
1151:DC 40 0C 29 10 8D 2E 0D 26
1159:84 0F 38 08 A9 10 CA 12 3E
1161:04 8D 84 A5 CB C9 C6 64 4B
1169:08 A9 00 6C 4C 06 51 C9 A7
1171:41 6A 05 A9 D0 15 60 20 C5
1179:5A 57 AD F6 58 8D 26 04 0D
1181:A2 00 BD F7 58 9D 08 04 79
1189:E8 E0 05 D0 F5 78 B7 59 60
1191:F0 72 36 03 04 D0 39 AD 43
1199:C8 58 29 08 D0 16 87 60 2A
11A1:64 E2 0A 71 22 90 61 F9 17
11A9:42 07 AC EC 8A 18 6D 8B 2E
11B1:90 61 69 29 2D 3C D4 D0 09
11B9:07 5A 10 C9 1E 90 48 A2 FA
11C1:03 1A D0 02 A2 06 CA D1 BA
11C9:1E 8E 19 22 61 2F 34 B0 C4
11D1:2F 94 89 0E 0C 01 08 E0 18
11D9:C6 58 A4 20 90 0E 62 0D 9A
11E1:09 78 BA 20 B7 51 8D C6 E4
11E9:0D 8B 1C C6 0E 83 D0 65 EA
11F1:A9 DA 09 EB AD 8C 18 69 B8
11F9:0C 8D 2B 5A B0 1D 52 04 33
1201:E3 0B 4D 14 C4 45 43 21 A7
1209:FD 0F 83 4C F3 51 AD 34 99
1211:29 FE 09 30 2A 10 F9 01 34
1219:DC 29 04 F0 08 AD C9 58 68
1221:F0 33 AE 21 52 A9 69 19 97
1229:00 8A 85 3C A9 40 85 3D FA
1231:A9 FF 8D E4 B8 05 0C 09 25
1239:37 E8 14 20 8D 92 AD 26 EF
1241:23 A0 D0 36 EE 61 02 AC 4A
1249:12 B1 3C C9 FF F0 06 8D 64
1251:03 24 BC 08 30 AD F3 58 90
1259:29 01 D4 22 A9 02 8D CA 4A
1261:58 A9 9A 8D F9 07 20 0D 81
1269:55 DC F3 17 A9 81 8D F8 C6
1271:07 A9 00 8D CF 58 C7 C7 93
1279:80 1E 4C EB 53 20 53 52 C1
1281:20 C3 54 C2 B8 8D CB 58 49
1289:CE 33 AD 02 D0 18 ED 50 CA
1291:01 EE 00 D0 4C 8E C5 4B 72
1299:55 A2 00 8E 52 16 8E 11 13
12A1:69 CC F1 20 B1 B8 03 0C 70
12A9:B0 75 A2 52 18 C9 28 90 C5
12B1:08 A0 00 46 DC 80 C2 52 27
12B9:88 8C CD 58 4C A7 52 AA D4
12C1:AD C9 15 D0 09 AD 1B D4 E8
12C9:2D CE 58 8D CC 58 8A 60 59
12D1:C9 0C A0 9F 0B 99 0A 0A C8
12D9:53 0D 61 2A 0E 4C 85 DC 43
12E1:A9 90 90 0A 09 A9 08 F0 A1
12E9:21 C9 0F B0 15 10 F0 19 E1
12F1:4C F2 52 4C 9B 86 57 07 B4
12F9:48 85 06 A9 11 30 15 12 84
1301:A6 08 C2 54 A6 48 05 85 FF
1309:94 04 98 12 13 53 14 62 1F
1311:4A 1E 4C B1 89 94 03 48 75
1319:89 02 29 01 31 25 00 A6 7E
1321:15 C4 94 16 98 12 17 53 85
1329:18 62 4A 44 4C BC 89 94 7E
1331:FF 48 89 FE 29 FD 31 25 53
1339:FC A6 19 C4 94 1A 98 12 47
1341:1B 53 1C 62 4A 6A 4C C7 CF
1349:53 C9 FB F0 1F C9 FA F0 21
1351:1B C9 F9 F0 17 C9 F8 F0 88
1359:13 C9 1D F0 0F C9 1E F0 FA
1361:0B C9 1F F0 89 0E E0 FD B6
1369:20 A4 DD 53 4C D2 53 D7 E5
1371:AE 34 14 43 F2 28 28 8A C5
1379:7C 14 14 CB 3E 0A 40 46 03
1381:01 00 8F 82 C2 31 47 41 EC
1389:E1 5E A3 B0 A9 81 85 3C 52
1391:A9 41 85 3D 87 0B 4C 4B AD
1399:55 A9 E5 8D 03 08 8E 00 BF
13A1:02 AD 82 C9 02 D0 EE 80 D2
13A9:1B C2 EE 50 04 AD C4 C9 1B
13B1:A3 D0 DF CE F9 07 EE 40 D0
13B9:B8 AD 80 20 C9 C8 D2 88 59
13C1:D0 88 36 E8 CE 31 02 AD B4
13C9:92 C9 2F D0 C0 86 8D BD 97
13D1:2A 59 46 05 20 5D 9D E0 0F
13D9:D9 E8 E0 28 D0 F0 AD 01 6C
13E1:C6 0D 04 F0 0A AD 00 DC 22
13E9:29 10 F0 03 4C 3A 54 98 83
13F1:0F C4 1A 01 C5 11 C6 10 34
13F9:01 C7 11 00 7A 8D C1 8D CF
1401:17 7D 8D CF 12 D0 10 01 B7
1409:D1 11 D2 10 01 D5 11 D8 14
1411:10 01 DB 11 DE 10 01 E1 29
1419:11 E4 10 01 F3 11 F4 90 73
1421:0D F5 21 34 8D F6 30 11 6E
1429:D3 0E 64 8D D4 81 11 FF F2
1431:8D CB D8 30 8D F7 84 09 8F
1439:F8 88 F9 80 08 FA 88 FB 80
1441:80 DC FE CA 24 BC CE 58 77
1449:A2 00 A0 00 88 D0 FD CA 25
1451:D0 FA 4C 31 EA 40 1F C1 95
1459:42 33 82 83 8B F1 C2 06 A7
1461:01 21 E1 80 30 6A A0 AD B0
1469:C4 84 C9 03 F0 1E A0 10 CF
1471:0E 8F 10 8E 07 C5 F9 67 1A
1479:84 41 0C 19 42 14 3C 81 A3
1481:8C 07 63 84 A9 A3 04 19 63
1489:60 82 C1 20 F8 8D 06 30 F6
1491:02 2D 8D 01 23 11 8D 04 44
1499:D4 A9 03 8D FF 58 20 1E 8F
14A1:00 59 60 AD 1E D0 A4 E1 66
14A9:01 D0 6A AD 98 0D F0 65 EE
14B1:AD E6 F0 30 42 32 6D 1C 5D
14B9:99 CD 4E B0 0B 09 29 09 CE
14C1:02 8D 10 C8 6E A8 80 97 8B
14C9:46 91 78 3C 90 38 71 6D 02
14D1:42 06 54 CE 8C 85 30 18 07
14D9:ED A0 07 8D 91 B0 08 20 5A
14E1:05 FD 4E A9 EE CC CA 29 D9
14E9:E4 0C 0F AD 02 D8 1E 90 84
14F1:03 4C BF 55 0A 0F 8D CD 71
14F9:12 CA 84 40 02 F0 3F AD 72
1501:A0 C9 81 D0 0F EE 84 0A 72
1509:AD CF 50 07 38 05 A9 80 22
1511:8D F8 07 AD 03 D0 C9 DA C5
1519:D0 08 A9 39 E7 4C 05 56 47
1521:EE 60 2E 08 04 C9 09 D0 4B
1529:10 D4 D0 30 0D E0 29 07 F2
1531:42 96 82 8D F9 07 EE 2A 3F
1539:AD 20 09 CD D4 D4 16 2C 92
1541:46 8D D2 58 66 A8 0B 47 05
1549:35 F3 4C 9C DF 24 0C 2D 33
1551:D3 B5 E0 F5 9D 68 0D AA A1
1559:80 F0 19 A9 01 B8 18 38 11
1561:58 71 60 50 70 30 4C 6D 6F
1569:56 5C B8 F8 03 DA 1D 3F 79
1571:A9 0A AA 4F 48 E4 7F 18 2A
1579:C9 3A 90 F3 9D E0 2D 00 33
1581:C3 B8 8D 97 04 0F F0 F6 1C
1589:99 29 D0 AD D1 C3 99 F0 81
1591:25 4A 4A 18 69 8A 99 FA 4F
1599:07 40 B8 39 88 C3 0C 18 85
15A1:27 BD D7 51 F1 05 D0 90 B4
15A9:0F A3 00 7C 18 05 4C C6 40
15B1:56 AD 58 00 53 15 D0 20 2E
15B9:D4 56 DC E1 CF 4C E2 7C 8F
15C1:C3 F0 4D BD D6 4C 37 1E 04
15C9:20 27 EB 60 90 03 48 90 03
15D1:36 0B 04 19 8F 0D 80 88 26
15D9:11 20 45 57 27 DE 63 06 34
15E1:18 FD 68 99 42 50 B0 04 F6
15E9:04 28 A0 82 ED 63 06 0F 74
15F1:50 4C 26 57 FE 20 35 98 0D
15F9:4A A8 43 F0 12 57 47 50 B7
1601:90 0B BE B6 06 86 58 60 D6
1609:AD 10 D0 90 3F F4 98 0A 3C
1611:A8 B9 04 D0 C9 0A 90 E2 08
1619:4C 44 6C 2E 06 2A 29 03 1B
1621:C9 02 D0 65 20 E7 54 AD 1A
1629:C6 0D F0 E4 14 30 E1 4C D9
1631:78 57 C0 CE 8D CD 88 1B 44
1639:D4 2D C7 00 8D CC 58 A0 05
1641:00 A2 00 AD F3 58 39 E7 4C
1649:58 D0 0B C8 E8 E8 E8 C0 41
1651:06 D0 F0 4C C8 57 BD 6D 24
1659:00 0F 8D 21 19 B9 FA 07 B9
1661:26 89 23 0D 82 9D D5 58 C6
1669:AE 0B 0B BD 52 59 8D 50 50
1671:AD FC 81 0E 03 E4 AD FD C9
1679:58 A2 04 20 C9 57 20 E5 CE
1681:57 60 18 7D C0 73 01 48 6A
1689:C9 3A 90 0D 18 E9 09 9D 24
1691:30 BC CA A9 01 E0 FF D0 55
1699:E8 60 4C 8C C1 78 F7 82 07
16A1:24 03 70 F8 C9 30 F0 16 45
16A9:70 62 F0 4F 90 99 D0 A9 EF
16B1:19 A1 0F 00 8D D2 9E 6C 16
16B9:83 F0 31 74 78 5A 0C 4F E5
16C1:33 1E 08 50 03 81 CE 67 38
16C9:65 46 CF 0A 03 8D D3 4F 1A
16D1:A3 39 D0 C8 A9 3C EB 80 5B
16D9:AD F9 6B 32 D0 81 A2 32 EF
16E1:64 4C C1 40 C9 35 D0 0D 61
16E9:A9 23 8D D4 58 A9 07 8D B7
16F1:CE 30 17 04 10 2B 09 A1 95
16F9:F8 58 CD 30 02 F0 17 8D 05
1701:FE 58 29 36 01 37 2C 55 DF
1709:EE 13 AD 10 03 C9 3A D0 AE
1711:03 CE F6 58 60 E1 0E F0 70
1719:2F EE 4E AD 00 59 C9 06 3E
1721:D0 25 AD 40 78 C9 01 08 AF
1729:2D 20 98 05 C9 02 D0 08 59
1731:A9 80 DC 07 4C BB 58 A9 0C
1739:10 8D 04 D4 A9 00 8D FF 09
1741:58 4C 31 EA A6 47 E8 FF A7
1749:21 10 05 01 64 2C 84 1D B6
1751:03 0C 08 D1 04 08 10 20 A2
1759:40 80 FB F7 EF DF BF 7F C4
1761:A0 7C 34 C1 04 30 30 90 73
1769:80 30 00 00 00 20 13 03 8D
1771:0F E1 32 D0 91 03 61 87 D5
1779:03 0E 04 0C 09 F5 13 3A 6E
1781:40 02 82 07 01 0D 05 20 77
1789:0F 16 05 12 2D 20 10 C4 55
1791:72 07 13 20 02 15 14 3B E6
1799:0E 20 14 0F 20 12 05 13 B0
17A1:14 01 12 14 20 20 20 09 68
17A9:08 08 07 07 06 05 04 02 7D
17B1:01 07 04 03 02 03 05 FF F8
17B9:00 04 00 00 00 00 00 00 E8
```

G

DISK EDITOR

Stacy J. Prowell

Examine and alter any byte on a disk with this flexible utility for the Commodore 64 and a 1541 or 1571 disk drive.

You probably use your disk drive mainly for loading and saving BASIC programs or for loading commercial software. You may even dabble with sequential and relative files. BASIC provides commands—LOAD, SAVE, OPEN, PRINT#, and so on—for performing these and other simple tasks. In addition, the Disk Operating System (DOS) provides high-level commands that handle other essential disk functions, such as formatting disks and scratching files. The advantage of these commands is that you don't need to know how the drive actually performs each task. For example, when you execute a SAVE command, you don't have to tell the drive how and where to store the file; BASIC and DOS take care of the details for you.

High-level commands are great for casual users and beginners, but some tasks can't be performed with a single command. For example, DOS has a scratch command, but no unscratch command. If you accidentally scratch a file, there's no command to bring it back, even though all the information is still on the disk. DOS also has the ability to lock a file so that it can't be scratched, but there's no command to let you use this feature.

To perform tasks for which there are no commands, you have to program the disk drive directly. DOS provides several low-level commands for this purpose. The Block-Read and Block-Write commands let you change the contents of an individual block or sector. They give you access to every byte on a disk, but using them from BASIC or machine language can be difficult. *Disk Editor* takes the work out of using low-level disk commands without taking away their power and flexibility.

Typing It In

Disk Editor is written in machine language, so to enter it, you'll need to use *MLX*, the machine language entry program found elsewhere in this issue. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: 8000
Ending address: 8F87

When you've finished typing, be sure to save a copy of the program to disk.

To run *Disk Editor*, type LOAD"*filename*",8,1 and then type NEW. Next, insert the disk you want to edit and type SYS 32768. Be very careful with *Disk Editor* until you're sure it works correctly. If you made a typing error when entering the program, it could ruin your disk. The first time you use it, work on a scratch disk. That way, if there's a problem, you won't lose valuable data.

Tracks and Sectors

To use *Disk Editor* effectively, it's important to understand how Commodore disks are organized. Disks formatted on the 1541 and single-sided disks formatted on the 1571 are divided into 35 tracks, and each track is divided into a number of sectors. Double-sided 1571 disks also have 35 tracks on the back side of the disk, for a total of 70 tracks. The longer tracks near the outer edge of a disk contain 21 sectors, while the shorter tracks near the center hub contain only 16. The tracks in between contain from 16 to 21 sectors, depending on the length of the track.

Each disk sector contains 256 bytes. Of these, 254 are available for storing data. The remaining 2 bytes contain a pointer to the next sector in a file. This pointer allows DOS to keep track of all the sectors in a file without having to keep lists of sectors in the directory.

The disk directory is used by DOS to keep track of which files are on the disk and where they're located. Each directory entry contains information about a file's type, location, name, and size. If DOS needs more information about a specific file—the record size for relative files, for example, it stores this information in the directory also.

The first sector of the disk directory, track 18, sector 0, contains the name of the disk and the Block Availability Map (BAM). The BAM lets DOS know which sectors are currently being used and which ones are free. Track 18, sector 1 is the first sector of the directory itself. It contains a pointer to the second directory sector and information about the first eight files on the disk.

You can learn more about your disks and disk drive by reading the manual that came with the drive. The appendices in the back of the manual are especially helpful for understanding how information is stored on disk. If you're interested in programming the drive yourself, the manual also has chapters on DOS commands and low-level programming.

Editing Disks

Disk Editor begins by reading track 18, sector 0 and displaying its contents in a 16 × 16 grid. The data is represented

by characters, so you should be able to read the name of the disk in the tenth line of the grid. If you can't, press SHIFT-Commodore to switch to upper-/lowercase characters. The previous, current, and next sectors are indicated to the right of the grid along with the number of sectors stored on the stack. *Disk Editor* displays the disk status below the grid.

The following paragraphs describe the commands available in *Disk Editor*. The commands are divided into two groups: those that affect the current sector, and those that are more general commands. The first group of commands, those that affect the current sector, are described below.

L Load a disk sector. When you press L, a cursor appears beside the label *This:*. To load a sector, enter the track number and press RETURN; then type the sector number. *Disk Editor* pushes the current track and sector numbers—hereafter referred to as the *sector pointer*—onto the stack and loads the sector indicated. If the sector you request doesn't exist, the disk status line displays *ILLEGAL TRACK OR SECTOR* and the grid's contents remain unchanged. If you press L accidentally, you can abort the command by entering spaces for the track number.

S Save a disk sector. This command works much the same way as the Load command except the contents of the grid are saved to the sector you indicate. To save to the current sector (the sector indicated by *This:*), simply press RETURN twice.

+, − Load an adjacent disk sector. Pressing + loads the next higher sector, while pressing − loads the next lower sector. For example, if the current sector is track 14, sector 3, pressing + loads sector 4 of track 14. Using the same example, pressing − loads sector 2 of track 14. If the current sector is the first in a track and you press −, *Disk Editor* loads the last sector from the previous track. Similarly, if the current sector is the last in a track and you press +, *Disk Editor* loads the first sector from the next track. Both commands push the current sector pointer onto the stack before loading the new sector. *If you own a 1571, note that the + and − commands won't work correctly with your disk drive. Neither command loads sectors from the back side of the disk (tracks 36–70).*

N Load next disk sector. Commodore disk sectors are chained together by the sector pointer in the first two bytes of the sector. For example, the first two bytes of track 18, sector 0 are 18 and 1. Thus, track 18, sector 1 follows track 18, sector 0 in the disk directory. *Disk Editor* displays the pointer to the next sector beside the label *NEXT:*. Pressing N saves the current sector pointer on the stack and loads the sector indicated by *NEXT:*. This command is handy for tracing through the sectors of a file or the disk directory.

P Load previous disk sector. Commodore disk sectors are linked by pointers in only one direction. You can follow the pointers from front to back, but you can't follow them from back to front. *Disk Editor* circumvents this problem with its stack. Each time you load a new disk sector, the program pushes the old sector pointer onto the stack. When you press P, it pops the top pointer from the stack and loads that sector from the disk. The number next to the label *Stack:* indicates how many sector pointers are on the stack. Once this value reaches 0, pressing P has no effect. The stack can hold up to 127 sector pointers.

SHIFT-1, SHIFT-2, SHIFT-3 Save grid. *Disk Editor* has three buffers into which you can store the contents of the grid. Hold down the SHIFT key and press 1, 2, or 3 to store the grid contents in a buffer. The track and sector numbers aren't stored with sector data, so you can use this command to copy sectors from one location to another or even from one disk to another.

Disk Editor Commands

Command	Action
L	Load a sector
S	Save a sector
+	Load adjacent sector (current plus 1)
−	Load adjacent sector (current minus 1)
N	Load next sector
P	Load previous sector
SHIFT-1, 2, 3	Save buffer
1, 2, 3	Recall buffer
H	Help
SPACE	Read disk error channel
@	Send disk command
F	Toggle format
D	Display directory
CTRL-K	Clear stack
CTRL-L	Change text color
CTRL-B	Change border color
CTRL-S	Change screen color
Q	Quit
E	Enter edit mode
CTRL-P	Position cursor
CTRL-C	Change value
CTRL-N	Load sector
RETURN	Exit edit mode
B	Enter BAM mode
CTRL-C	Toggle sector
CTRL-P	Plot file map
CTRL-W	Write BAM
RETURN	Exit BAM mode

1, 2, 3 Recall grid. Press 1, 2, or 3 to place the contents of one of the buffers back into the grid. These commands don't change the sector pointer, so it may be invalid after the command is executed.

General Commands

The following commands are more general and affect the disk as a whole or the program itself.

H Help. Pressing H displays a summary of the commands and their respective keystrokes. Press any key to return to the main screen.

SPACE Read the disk drive error channel. Pressing the space bar updates the disk-status display at the bottom of the screen.

@ Send a disk command. By pressing @, you can send any disk command to the disk drive. For example, press @ and then type V0: to validate the disk.

F Change grid format. Pressing F allows you to toggle the format of the grid between the 16 × 16 standard format, the default, and the 32 × 8 directory format. Directory format makes finding filenames in the disk directory much easier, because each directory entry is listed on a line by itself.

D Display disk directory. Pressing D displays the disk's directory in a format similar to that available from BASIC. *Disk Editor* displays the file length, filename, and file type (including files of type DEL) and the location of each file's first sector. For relative files, *Disk Editor* shows the record length and location of the first side sector, too. Press SHIFT-LOCK to pause the directory. Release it to continue. Press RUN/STOP to abort the directory.

CTRL-K Clear the stack. Pressing CTRL-K resets the stack pointer to 0, effectively removing all sector pointers from the stack.

CTRL-L Change the text color.

CTRL-B Change the border color.

CTRL-S Change the screen color.

Q Quit. Pressing Q allows you to exit *Disk Editor* and return to BASIC.

The remaining two commands change *Disk Editor*'s mode of operation and are described in detail below.

Edit Mode

Pressing E puts *Disk Editor* into edit mode. The edit screen looks exactly like the main screen except that a box ap-

pears in the upper left corner of the grid and four numbers appear at the bottom of the screen. The first three numbers are the value of the byte under the cursor in decimal, hexadecimal, and binary, respectively. The fourth number is the cursor position within the grid.

Move the cursor over the grid with the cursor keys. To change the value under the cursor, press CTRL-C and then enter the new value. To enter values as hexadecimal, type a $ before the value. To enter binary values, type a % before the number. If neither of these characters precedes the number, the value is assumed to be decimal. If you want to enter values as text, simply position the cursor and begin typing. Pressing CTRL-9 turns reverse text on, and CTRL-0 turns reverse text off, just as in the BASIC editor. The line at the bottom of the screen indicates whether reverse mode is on or off.

You can move the cursor to a specific position within the grid by pressing CTRL-P and entering the location. As with the CTRL-C command above, you can enter this value as decimal, hexadecimal, or binary.

Sector pointers are usually stored in the first two bytes of a disk sector, but not always. Directory sectors contain up to eight sector pointers other than the one in the first two bytes. To load a sector pointed to by these pointers, you could enter edit mode, write down the track and sector numbers, and then use the Load command. But there's an easier way. Simply place the edit cursor over the first byte of the sector pointer and press CTRL-N. *Disk Editor* stores the current sector pointer on the stack and loads the new sector from disk.

Press RETURN to exit edit mode and return to the main screen.

BAM Mode

The Block Availability Map, stored on track 18, sector 0, is a binary map of all the sectors on the disk. Every sector on the disk has a corresponding bit in the BAM which tells DOS whether or not that sector is allocated. Unfortunately, the BAM is difficult to read from a disk sector editor (unless you can convert Commodore screen codes to binary in your head). *Disk Editor*'s BAM mode simplifies viewing and editing a disk's BAM.

Pressing B from the main screen loads and displays the BAM from the disk. *Disk Editor* displays the BAM in table form. The tracks are listed along the top of the table; the sectors are listed down the left side. Each sector is represented on the table by a dot. If the dot is displayed in reverse video, the corresponding sector is free. If the dot is displayed normally, the corresponding sector is allocated. The number of free blocks is shown in the lower right corner of the screen.

When you first enter BAM mode, the cursor is in the upper left corner of the screen. You can use the cursor keys to move it over the screen. Press CTRL-C to toggle the status of the sector under the cursor. As you free and allocate sectors, the number of free blocks, displayed in the lower right corner, changes.

Occasionally, you need to know which sectors are occupied by a specific file. For example, you may suspect that a file on your disk is corrupted and occupies the same sectors as another file. You can plot the sectors that a file occupies by moving the edit cursor to the first sector of the file and pressing CTRL-P. All of the sectors occupied by the file are marked with an asterisk. So if you plot the sectors for a file you think is corrupted and then plot the sectors for a good file, you can actually see whether the two occupy the same sectors.

After you've finished editing the BAM, you can press CTRL-W to save it back to disk. Pressing RETURN takes you back to the main screen.

Using *Disk Editor* with BASIC

Disk Editor occupies the area of memory beginning at $8000 (32768). If you need to use it and BASIC at the same time, you must protect *Disk Editor* from BASIC. To do this, enter the following commands after you load *Disk Editor* and before you type SYS 32768.

```
POKE 56,128:POKE 55,0:NEW
```

This command sequence moves BASIC's top-of-string pointer below *Disk Editor* so that the program won't be overwritten by string data.

Disk Editor

```
8000:4C 4A 8F 00 00 00 00 00 AB
8008:55 31 3A 32 2C 30 2C 00 E4
8010:55 32 3A 32 2C 30 2C 00 2D
8018:42 2D 50 3A 32 2C 30 0D E2
8020:00 23 0D 24 4C 45 44 51 1F
8028:45 53 47 52 50 52 53 55 76
8030:4C 45 52 3F 3F 31 3F 3F 63
8038:32 3F 3F 33 00 00 00 00 3D
8040:00 10 0D FF F0 00 C0 30 20
8048:00 C0 30 00 C0 30 00 C0 07
8050:30 00 C0 30 00 C0 30 00 E7
8058:C0 30 00 C0 30 00 FF F0 44
8060:00 00 00 00 00 00 00 00 61
8068:00 00 00 00 00 00 00 00 69
8070:00 00 00 00 00 00 00 00 71
8078:00 00 00 00 00 00 00 00 79
8080:00 00 00 30 31 32 33 34 71
8088:35 36 37 38 39 41 42 43 B2
8090:44 45 46 40 00 00 00 00 D1
8098:15 15 15 15 15 15 15 15 99
80A0:15 15 15 15 15 15 15 15 A1
80A8:15 13 13 13 13 13 13 13 AA
80B0:12 12 12 12 12 12 11 11 AE
80B8:11 11 11 00 50 52 45 53 52
80C0:53 20 48 20 46 4F 52 20 B2
80C8:48 45 4C 50 00 00 00 50 1E
80D0:52 45 56 3A 00 54 48 49 E5
80D8:53 3A 00 4E 45 58 54 3A 65
80E0:00 00 53 54 41 43 4B 3A 79
80E8:00 93 44 49 53 4B 20 45 39
80F0:44 49 54 4F 52 20 56 45 EA
80F8:52 20 30 37 38 38 20 42 C9
8100:59 20 53 54 41 43 59 20 51
8108:50 52 4F 57 45 4C 4C 0D 28
8110:0D 3C 4C 3E 20 4C 4F 41 28
8118:44 20 20 20 20 20 20 20 2D
8120:20 20 20 20 20 3C 53 3E 18
8128:20 53 41 56 45 0D 3C 2B 9F
8130:3E 20 3C 2D 3E 20 41 44 ED
8138:4A 41 43 45 4E 54 20 20 91
8140:20 20 3C 4E 3E 20 3C 50 03
8148:3E 20 43 48 41 49 4E 0D 38
8150:3C 40 3E 20 43 4F 4D 4D 8A
8158:41 4E 44 20 20 20 20 20 FB
8160:3C 53 50 41 43 45 3E 20 40
8168:52 45 41 44 20 45 52 52 5F
8170:4F 52 0D 3C 45 3E 20 45 BD
8178:44 49 54 20 42 4C 4F 43 A1
8180:4B 20 20 20 20 20 20 3C 35
8188:42 3E 20 45 44 49 54 20 A4
8190:42 41 4D 0D 3C 51 3E 20 43
8198:51 55 49 54 20 20 20 20 E9
81A0:20 20 20 20 20 20 20 20 A3
81A8:3C 44 3E 20 44 49 52 45 D5
81B0:43 54 4F 52 59 0D 0D 43 D5
81B8:54 52 4C 2D 4B 20 52 45 9B
81C0:53 45 54 20 53 54 41 43 FC
81C8:4B 20 20 43 54 52 4C 2D 63
81D0:4C 20 54 45 58 54 20 43 78
81D8:4F 4C 4F 52 0D 43 54 52 16
81E0:4C 2D 42 20 42 41 43 4B 88
81E8:47 52 4F 55 4E 44 20 20 47
81F0:20 43 54 52 4C 2D 53 20 62
81F8:53 43 52 45 45 4E 20 43 FB
8200:4F 4C 4F 52 0D 0D 3C 31 15
8208:3E 20 3C 32 3E 20 3C 33 FC
8210:3E 20 50 55 4C 4C 20 42 B1
8218:4C 4F 43 4B 20 46 52 4F 42
8220:4D 20 4D 45 4D 4F 52 59 77
8228:0D 20 20 20 20 57 49 54 07
8230:48 20 53 48 49 46 54 20 7C
8238:2D 20 50 55 54 20 42 4C 2F
8240:4F 43 4B 20 49 4E 20 4D 3A
8248:45 4D 4F 52 59 0D 0D 49 B4
8250:4E 20 42 41 4D 3A 20 43 B7
8258:54 52 4C 2D 43 20 54 4F 0B
8260:47 47 4C 45 53 20 42 4C A4
8268:4F 43 4B 0D 20 20 20 20 02
8270:20 20 20 20 43 54 52 4C EF
8278:2D 57 20 57 52 49 54 45 09
8280:53 20 42 41 4D 0D 20 20 92
8288:20 20 20 20 20 20 43 54 08
8290:52 4C 2D 50 20 50 4C 4F A6
8298:54 53 20 43 55 52 52 45 B2
82A0:4E 54 20 43 48 41 49 4E 42
82A8:0D 0D 49 4E 20 45 44 49 6D
82B0:54 3A 20 43 54 52 4C 2D 58
82B8:50 20 50 4F 53 49 54 49 9E
82C0:4F 4E 53 20 43 55 52 53 D4
82C8:4F 52 0D 20 20 20 20 20 8F
82D0:20 20 20 20 43 54 52 4C 50
82D8:2D 43 20 43 48 41 4E 47 A8
82E0:45 53 20 44 41 54 41 0D 90
82E8:20 20 20 20 20 20 20 20 ED
82F0:20 43 54 52 4C 2D 4E 20 5A
82F8:4C 4F 41 44 53 20 42 4C 50
8300:4F 43 4B 20 46 52 4F 4D 52
8308:20 50 4F 49 4E 54 45 52 52
8310:57 49 54 48 20 43 55 52 2F
8318:53 4F 52 3A 20 43 54 52 93
8320:4C 2D 4C 20 43 48 41 4E 30
8328:47 45 53 20 43 55 52 53 F7
8330:4F 52 20 43 4F 4C 4F 52 48
8338:0D 3C 52 45 54 55 52 4E 5E
8340:3E 20 45 58 49 54 53 20 FE
8348:45 44 49 54 20 41 4E 44 58
8350:20 42 41 4D 20 4D 4F 44 0E
8358:45 53 00 20 5C 8C A9 E9 2B
8360:85 FC A9 80 85 FD A0 00 0C
8368:B1 FC F0 0B 20 D2 FF E6 89
8370:FC D0 F5 E6 FD D0 F1 20 8E
8378:AF 83 4C 0B 8D 48 A4 D3 1D
8380:B1 D1 49 80 91 D1 68 60 0B
8388:29 7F 8D 03 80 29 60 D0 20
8390:06 AD 03 80 09 40 60 C9 42
8398:20 D0 04 AD 03 80 60 C9 E3
83A0:40 D0 06 AD 03 80 09 20 E3
```

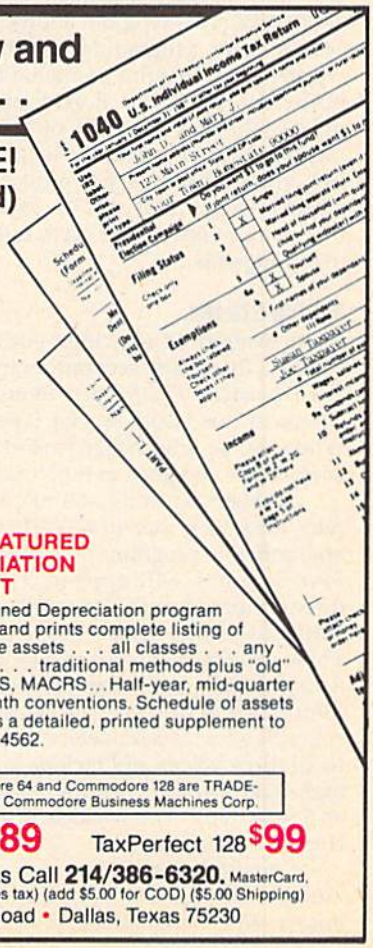
```
83A8:60 AD 03 80 49 C0 60 20 E1
83B0:E4 FF C9 00 F0 F9 60 8D 21
83B8:05 80 8D 06 80 A5 D3 8D 44
83C0:04 80 20 7D 83 20 AF 83 45
83C8:20 7D 83 C9 0D F0 45 C9 CC
83D0:9D F0 24 C9 14 F0 20 C9 72
83D8:1D F0 2C 8D 03 80 29 E0 56
83E0:F0 E0 29 80 D0 DC AD 03 1E
83E8:80 AE 06 80 F0 D4 20 D2 92
83F0:FF CE 06 80 4C C2 83 AE 97
83F8:06 80 EC 05 80 F0 C3 EE 4F
8400:06 80 C6 D3 4C C2 83 AE 65
8408:06 80 F0 B6 CE 06 80 E6 34
8410:D3 4C C2 83 AD 05 80 18 41
8418:6D 04 80 A8 88 B1 D1 C9 EB
8420:20 D0 0C 88 CC 04 80 B0 9F
8428:F4 A9 00 8D 00 02 60 C8 80
8430:8C 06 80 AC 04 80 A2 00 43
8438:B1 D1 20 88 83 9D 00 02 AF
8440:E8 C8 CC 06 80 90 F1 A9 BD
8448:00 9D 00 02 60 29 7F 2C AB
8450:93 80 F0 03 18 69 09 29 33
8458:0F 60 A2 00 86 FC A9 0A DA
8460:85 FE AD 00 02 D0 01 60 57
8468:C9 24 D0 07 A9 10 85 FE 81
8470:E8 D0 09 C9 25 D0 05 A9 FF
8478:02 85 FE E8 BD 00 02 D0 15
8480:03 A5 FC 60 48 A5 FE 85 76
8488:FD 20 9B 84 68 20 4D 84 37
8490:18 65 FC 85 FC E8 D0 E4 09
8498:A5 FC 60 18 A9 00 A0 08 D7
84A0:6A 66 FC 90 03 18 65 FD 62
84A8:88 10 F5 85 FD 60 85 FC 8A
84B0:A9 25 20 D2 FF A2 08 26 C9
84B8:FC 2A 29 01 09 30 20 D2 1C
84C0:FF CA D0 F3 60 85 FC A9 92
84C8:24 20 D2 FF A2 02 86 FD 6E
84D0:A0 04 26 FC 2A 88 D0 FA CF
84D8:29 0F AA BD 83 80 20 D2 9C
84E0:FF C6 FD D0 EB 60 85 FC 51
84E8:C9 64 B0 12 A9 30 20 D2 48
84F0:FF A5 FC C9 0A B0 07 A9 6A
84F8:30 20 D2 FF A5 FC AA A9 9C
8500:00 20 CD BD 60 85 FC C9 85
8508:64 90 E6 A9 2D 20 D2 FF 70
8510:20 D2 FF 60 AD 94 80 8D 34
8518:03 80 AE 41 80 CA 8A 2D 20
8520:03 80 A8 AD 03 80 4A 4A B5
8528:4A 4A 8D 03 80 AD 41 80 8A
8530:C9 20 D0 03 4E 03 80 AE A0
8538:03 80 60 A9 00 8D 94 80 6B
8540:20 90 8E 20 F8 85 20 2E 9F
8548:86 20 AF 83 C9 03 D0 1B E3
8550:20 0B 8D A9 09 20 B7 83 36
8558:E0 00 F0 E7 20 5A 84 AE 92
8560:94 80 9D 00 98 20 F4 8B 44
8568:4C 43 85 C9 0C D0 06 20 87
8570:86 8E 4C 43 85 C9 10 D0 64
8578:15 20 0B 8D A9 09 20 B7 B9
8580:83 E0 00 F0 BE 20 5A 84 44
8588:8D 94 80 4C 43 85 C9 13 2B
8590:D0 08 A9 00 8D 94 80 4C 47
8598:43 85 C9 91 D0 0D AD 94 A3
85A0:80 38 ED 41 80 8D 94 80 AF
85A8:4C 43 85 C9 11 D0 0D AD 8B
85B0:41 80 18 6D 94 80 8D 94 AC
85B8:80 4C 43 85 C9 9D D0 06 44
85C0:CE 94 80 4C 43 85 C9 1D 0E
85C8:D0 06 EE 94 80 4C 43 85 26
85D0:C9 0E D0 1C 20 70 8D AE AC
85D8:94 80 BD 00 98 8D 3F 80 FF
85E0:E8 BD 00 98 8D 40 80 20 E7
85E8:2B 8B 20 7D 8C 4C 3B 85 D9
85F0:C9 0D D0 40 20 BA 8E 60 AB
85F8:A0 00 A2 15 20 F3 8D AE 94
8600:94 80 BD 00 98 8D 95 80 D5
8608:20 E6 84 20 73 86 AD 95 18
8610:80 20 C5 84 A9 20 20 73 E7
8618:86 AD 95 80 20 AE 84 20 73
8620:73 86 A9 3A 20 D2 FF AD 5B
8628:94 80 20 E6 84 60 20 14 0C
8630:85 4C C3 8E C9 12 D0 06 B2
8638:20 D2 FF 4C 43 85 C9 92 25
8640:D0 06 20 D2 FF 4C 43 85 A5
8648:C9 20 90 08 C9 80 90 07 4D
8650:C9 A0 B0 03 4C 43 85 8D B8
8658:3E 80 20 14 85 E8 C8 E8 34
8660:C8 20 F3 8D AD 3E 80 20 B8
8668:D2 FF EE 94 80 20 5C 8C CF
8670:4C 43 85 A9 20 20 D2 FF E6
8678:4C D2 FF 20 0B 8D A9 14 58
8680:20 B7 83 20 03 8B A2 0F 98
8688:20 C9 FF AD 00 02 F0 0D E9
8690:A2 00 BD 00 02 F0 06 20 A6
8698:D2 FF E8 D0 F5 20 CC FF 03
86A0:20 52 8D A9 0F 20 C3 FF 1F
86A8:60 AD 3F 80 8D 94 80 AD AE
86B0:40 80 8D 95 80 A9 12 8D 65
86B8:3F 80 A9 00 8D 40 80 20 49
86C0:5C 8C A9 04 20 A9 8B 20 73
86C8:2B 8B AD 94 80 8D 3F 80 86
86D0:AD 95 80 8D 40 80 A9 93 ED
86D8:20 D2 FF A9 52 85 FC A9 91
86E0:04 85 FD A2 05 A0 00 8C 72
86E8:3E 80 BD 00 98 8D 03 80 6E
86F0:A0 08 8A 29 03 C9 03 D0 4A
86F8:0A AC 3E 80 B9 98 80 38 6F
8700:E9 10 A8 8C 95 80 A9 5C 44
8708:6E 03 80 6A AC 3E 80 91 B6
8710:FC 20 4E 8C CE 95 80 D0 D6
8718:ED E8 8A 29 03 D0 CB E8 18
8720:EE 3E 80 A9 52 85 FC A9 2D
8728:04 85 FD AD 3E 80 C9 23 DF
8730:90 B8 A2 30 8E 02 04 E8 7A
8738:8E 2A 04 A2 00 BD 02 04 C2
8740:9D 03 04 BD 2A 04 9D 2B 03
8748:04 FE 2B 04 BD 2B 04 C9 2B
8750:3A 90 08 FE 03 04 A9 30 3D
8758:9D 2B 04 E8 E0 22 D0 DD 1F
8760:A9 14 8D 96 80 AE 96 80 D0
8768:E8 E8 A0 00 20 F3 8D AD D3
8770:96 80 20 05 85 CE 96 80 54
8778:10 EB 20 D4 88 60 20 A9 8B
8780:86 20 8D 87 20 0B 8D A9 F6
8788:04 20 BD 8B 60 A9 00 8D 49
8790:95 80 8D 96 80 20 90 8E D9
8798:AE 96 80 AC 95 80 20 C3 32
87A0:8E 20 AF 83 C9 0C D0 06 53
87A8:20 86 8E 4C 98 87 C9 03 79
87B0:D0 32 AE 96 80 E8 E8 AC 1A
87B8:95 80 C8 C8 20 F3 8D A4 E8
87C0:D3 B1 D1 49 80 91 D1 AD 90
87C8:95 80 0A 0A 18 69 04 AA BD
87D0:B1 D1 2A 90 06 FE 00 98 40
87D8:4C DE 87 DE 00 98 20 D4 1C
87E0:88 4C 98 87 C9 13 F0 A5 F4
87E8:C9 91 D0 0A CE 96 80 10 DD
87F0:F0 EE 96 80 10 EB C9 17 E9
87F8:D0 19 AD 95 80 48 AD 96 DC
8800:80 48 20 62 88 20 DB 86 90
8808:68 8D 96 80 68 8D 95 80 B0
8810:4C 98 87 C9 11 D0 13 EE DB
8818:96 80 AD 96 80 AE 95 80 1E
8820:DD 98 80 90 BC CE 96 80 2E
8828:D0 B7 C9 9D D0 0A CE 95 84
8830:80 10 AE EE 95 80 10 A9 C2
8838:C9 1D D0 14 EE 95 80 AE 4E
8840:95 80 AD 96 80 DD 98 80 88
8848:90 97 CE 95 80 4C E1 87 3B
8850:C9 0D D0 04 20 BA 8E 60 4D
8858:C9 10 D0 85 20 8B 8A 4C 55
8860:E1 87 A9 52 85 FC A9 04 16
8868:85 FD A2 05 A0 00 8C 3E BC
8870:80 A0 08 8C 95 80 AC 3E F9
8878:80 B1 FC 2A 6E 03 80 20 19
8880:4E 8C CE 95 80 D0 EF AD E3
8888:03 80 9D 00 98 E8 8A 29 95
8890:03 D0 DE BD FF 97 29 3F FE
8898:9D FF 97 E8 EE 3E 80 A9 15
88A0:52 85 FC A9 04 85 FD AD 56
88A8:3E 80 C9 23 90 C3 AD 3F 92
88B0:80 8D 94 80 AD 40 80 8D FC
88B8:95 80 A9 12 8D 3F 80 A9 1F
88C0:00 8D 40 80 20 6A 8B AD B4
88C8:94 80 8D 3F 80 AD 95 80 50
88D0:8D 40 80 60 A2 04 A9 00 47
88D8:85 FC 85 FD BD 00 98 E8 84
88E0:E8 E8 E8 E0 94 B0 0A 65 AC
88E8:FC 85 FC 90 EF E6 FD D0 6A
88F0:EB A0 24 A2 16 20 F3 8D 75
88F8:A5 FD A6 FC 20 CD BD A9 5E
8900:20 20 D2 FF 20 D2 FF 20 F1
8908:D2 FF 60 20 03 8B A2 0F 2D
8910:20 C9 FF A9 49 20 D2 FF B0
8918:A9 0D 20 D2 FF 20 CC FF 8E
8920:A9 0F 20 C3 FF A9 02 A2 59
8928:08 A0 02 20 BA FF A9 01 D3
8930:A2 23 A0 80 20 BD FF 20 91
8938:C0 FF A2 02 20 C6 FF 20 5C
8940:5C 8C A9 93 20 D2 FF A2 02
8948:8E 20 62 8A A9 12 20 D2 48
8950:FF A2 12 20 6C 8A A2 08 2B
8958:8E 94 80 20 CF FF 20 D2 7B
8960:FF CE 94 80 D0 F5 A9 0D 80
8968:20 D2 FF A2 56 20 62 8A EC
8970:A2 00 8E 03 80 AD 03 80 18
8978:29 07 F0 05 A2 02 20 62 10
8980:8A 20 CF FF 8D 3E 80 20 61
8988:CF FF 8D 95 80 20 CF FF B2
8990:8D 96 80 A9 06 85 D3 A2 4B
8998:10 20 6C 8A A9 21 85 D3 A2
89A0:20 1D 8D A9 1A 85 D3 AD 93
89A8:3E 80 29 07 85 FC A9 03 07
89B0:85 FD 20 9B 84 A9 24 18 EE
89B8:65 FC 85 FC 90 02 E6 FD 96
89C0:A9 80 18 65 FD 85 FD AD D1
89C8:3E 80 A0 20 29 80 D0 02 20
89D0:A0 2A 98 20 D2 FF A0 02 AD
89D8:B1 FC 20 D2 FF 88 10 F8 70
89E0:A9 20 20 D2 FF AD 3E 80 B5
89E8:29 40 F0 05 A9 3C 20 D2 60
89F0:FF A9 00 85 D3 20 CF FF 85
89F8:8D 95 80 20 CF FF 8D 96 7A
8A00:80 20 CF FF 8D 94 80 A2 B9
8A08:06 20 62 8A 20 CF FF 85 E2
8A10:FC 20 CF FF A6 FC 20 CD DC
8A18:BD A9 0D 20 D2 FF AD 3E 4A
8A20:80 29 07 C9 04 D0 17 A9 78
8A28:05 85 D3 AD 94 80 20 E6 44
8A30:84 A9 20 20 D2 FF 20 1D EB
8A38:8D A9 0D 20 D2 FF EE 03 99
8A40:80 20 E1 FF F0 0E AD 8D 82
8A48:02 29 01 D0 F9 A5 90 D0 2E
8A50:03 4C 75 89 20 CC FF A9 1F
8A58:02 20 C3 FF 20 AF 83 4C 02
8A60:0B 8D 86 FE 20 CF FF C6 26
8A68:FE D0 F9 60 86 FE A9 22 1C
8A70:20 D2 FF 20 CF FF C9 A0 FE
8A78:D0 04 A4 C7 F0 03 20 D2 AE
8A80:FF C6 FE D0 EE A9 22 20 B6
8A88:D2 FF 60 AD 3F 80 8D 03 08
8A90:80 AD 40 80 8D 94 80 A9 CA
8A98:05 8D 07 80 20 A9 8B 20 5B
8AA0:2B 8B AE 40 80 E8 E8 AC 2E
8AA8:3F 80 C8 20 F3 8D A4 D3 8B
8AB0:B1 D1 29 FB 91 D1 AD 00 27
8AB8:98 F0 1B 8D 3F 80 C9 24 46
8AC0:B0 14 AA AD 01 98 8D 40 29
8AC8:80 DD 97 80 B0 08 20 2B A1
8AD0:8B 20 E1 FF D0 CC AD 03 08
8AD8:80 8D 3F 80 AD 94 80 8D CF
8AE0:40 80 A9 05 20 BD 8B A9 74
8AE8:00 8D 07 80 60 A2 0F 20 16
8AF0:C9 FF A2 00 BD 18 80 F0 7F
8AF8:06 20 D2 FF E8 D0 F5 20 0A
8B00:CC FF 60 A9 0F A2 08 A0 D7
8B08:0F 20 BA FF A9 00 20 BD 51
8B10:FF 20 C0 FF 60 A9 02 A2 97
8B18:08 A0 02 20 BA FF A9 02 C8
8B20:A2 21 A0 80 20 BD FF 20 05
8B28:C0 FF 60 20 03 8B 20 15 49
8B30:8B A2 0F 20 C9 FF A2 00 2D
8B38:BD 08 80 F0 06 20 D2 FF A5
8B40:E8 D0 F5 20 D1 8B A2 02 C4
8B48:20 C6 FF A2 00 8E 3D 80 80
8B50:20 CF FF AE 3D 80 9D 00 7D
8B58:98 E8 D0 F1 20 CC FF A9 0D
8B60:02 20 C3 FF A9 01 20 C3 4E
8B68:FF 60 20 03 8B 20 15 8B 5E
8B70:20 ED 8A A2 02 20 C9 FF B2
8B78:A2 00 BD 00 98 20 D2 FF 83
8B80:E8 D0 F7 20 CC FF A2 0F FB
8B88:20 C9 FF A2 00 BD 10 80 E3
8B90:F0 06 20 D2 FF E8 D0 F5 0E
8B98:20 D1 8B 20 CC FF A9 02 63
```

```
8BA0:20 C3 FF A9 01 20 C3 FF 63
8BA8:60 18 69 98 85 FD A9 00 24
8BB0:85 FC A0 00 B9 00 98 91 6E
8BB8:FC C8 D0 F8 60 18 69 98 F8
8BC0:85 FD A9 00 85 FC A0 00 B0
8BC8:B1 FC 99 00 98 C8 D0 F8 AD
8BD0:60 A9 00 AE 3F 80 20 CD 77
8BD8:BD A9 20 20 D2 FF A9 00 29
8BE0:AE 40 80 20 CD BD A9 0D 37
8BE8:20 D2 FF 20 CC FF 20 52 BF
8BF0:8D 4C ED 8A A9 29 85 FC 42
8BF8:A9 04 85 FD A0 00 AE 41 1A
8C00:80 A9 70 91 FC C8 A9 40 89
8C08:91 FC C8 CA D0 FA A9 6E 23
8C10:91 FC A2 00 20 4E 8C A9 82
8C18:5D 91 FC AD 41 80 85 FE D4
8C20:C8 BD 00 98 91 FC E8 F0 D9
8C28:04 C6 FE D0 F3 A9 5D C8 AB
8C30:91 FC E0 00 D0 DE 20 4E FD
8C38:8C A9 6D 91 FC AE 41 80 6E
8C40:A9 40 C8 91 FC CA D0 FA 20
8C48:A9 7D C8 91 FC 60 A9 28 AC
8C50:18 65 FC 85 FC 90 02 E6 DB
8C58:FD A0 00 60 A9 52 85 FC 3D
8C60:A9 04 85 FD A2 00 A0 00 36
8C68:B1 FC 9D 00 98 E8 F0 0C A3
8C70:C8 CC 41 80 90 F2 20 4E 30
8C78:8C 4C 68 8C 60 20 2F 8D 30
8C80:20 F4 8B A9 CB 85 FC A9 0B
8C88:05 85 FD A2 08 86 FE A0 68
8C90:00 A2 00 E8 BD BB 80 F0 AF
8C98:07 29 3F 91 FC C8 D0 F3 21
8CA0:20 4E 8C C6 FE D0 EC AE 1F
8CA8:97 80 CA BD 00 97 8D 96 F2
8CB0:80 CA BD 00 97 8D 95 80 13
8CB8:A0 19 A2 0E 20 F3 8D 20 A9
8CC0:1D 8D AE 3F 80 8E 95 80 7F
8CC8:AE 40 80 8E 96 80 A0 19 53
8CD0:A2 0F 20 F3 8D 20 1D 8D F6
8CD8:AD 00 98 8D 95 80 AD 01 BF
8CE0:98 8D 96 80 A0 19 A2 10 43
8CE8:20 F3 8D 20 1D 8D A0 19 3C

8CF0:A2 12 20 F3 8D AD 97 80 F5
8CF8:4A 20 E6 84 60 20 03 8B 79
8D00:A2 0F 20 52 8D A9 0F 20 AA
8D08:C3 FF 60 A2 28 A9 20 9D 01
8D10:1F 07 CA D0 FA A0 00 A2 DF
8D18:14 20 F3 8D 60 AD 95 80 02
8D20:20 05 85 A9 2C 20 D2 FF 5F
8D28:AD 96 80 20 05 85 60 A9 7A
8D30:20 A2 00 9D 00 04 9D 00 29
8D38:05 9D 00 06 E8 D0 F4 A2 B4
8D40:1F 9D 00 07 CA 10 FA A2 F1
8D48:00 9D 48 07 E8 E0 A0 D0 21
8D50:F8 60 AD 07 80 D0 15 A2 3A
8D58:0F 20 C6 FF 20 0B 8D 20 44
8D60:CF FF C9 0D F0 06 20 D2 20
8D68:FF 4C 5F 8D 20 CC FF 60 EF
8D70:AD 3F 80 AE 97 80 9D 00 27
8D78:97 AD 40 80 E8 9D 00 97 30
8D80:E8 8E 97 80 60 AE 97 80 1C
8D88:CA BD 00 97 8D 40 80 CA 2B
8D90:BD 00 97 8D 3F 80 8E 97 07
8D98:80 60 20 70 8D AD 00 98 D2
8DA0:8D 3F 80 AD 01 98 8D 40 03
8DA8:80 20 2B 8B 60 20 85 8D 46
8DB0:20 2B 8B 60 AE 3F 80 EE 80
8DB8:40 80 AD 40 80 DD 97 80 F8
8DC0:90 12 A9 00 8D 40 80 EE 3B
8DC8:3F 80 E8 E0 24 90 05 A2 DE
8DD0:01 8E 3F 80 4C 2B 8B AE D4
8DD8:3F 80 CE 40 80 10 11 CA C2
8DE0:D0 02 A2 23 BD 97 80 8D 46
8DE8:40 80 CE 40 80 8E 3F 80 5F
8DF0:4C 2B 8B 18 20 F0 FF 60 15
8DF8:A2 0F A0 19 20 F3 8D A9 64
8E00:02 20 B7 83 20 5A 84 E0 A9
8E08:00 D0 01 60 8D 3F 80 A2 8C
8E10:0F A0 1C 20 F3 8D A9 02 8D
8E18:20 B7 83 20 5A 84 E0 00 4C
8E20:D0 01 60 8D 40 80 60 20 AF
8E28:F8 8D E0 00 D0 01 60 20 AC
8E30:2B 8B 60 20 F8 8D E0 00 93
8E38:D0 01 60 20 5C 8C 20 6A CB

8E40:8B 60 AD 41 80 49 30 29 B7
8E48:30 8D 41 80 60 68 68 00 86
8E50:A9 00 8D 97 80 60 AD 3C 8A
8E58:80 29 03 4C BD 8B AD 3C D8
8E60:80 29 03 4C A9 8B EE 20 A6
8E68:D0 60 EE 21 D0 60 EE 86 62
8E70:02 AD 86 02 A2 00 9D 00 3B
8E78:D8 9D 00 D9 9D 00 DA 9D 47
8E80:00 DB E8 D0 F1 60 EE 42 EF
8E88:80 AD 42 80 8D 2E D0 60 C8
8E90:A2 3F BD 43 80 9D 40 03 B8
8E98:CA 10 F7 A9 0D 8D FF 07 5E
8EA0:AD 42 80 8D 2E D0 A9 00 16
8EA8:8D 1C D0 8D 1D D0 8D 17 E4
8EB0:D0 8D 1B D0 A9 80 8D 15 89
8EB8:D0 60 AD 15 D0 29 7F 8D 15
8EC0:15 D0 60 84 FC 8E 3E 80 10
8EC8:A9 08 85 FD 20 9B 84 A9 6F
8ED0:26 18 65 FC 85 FC 90 02 C6
8ED8:E6 FD A5 FC 8D 0E D0 AD 61
8EE0:10 D0 29 7F 66 FD 90 02 A5
8EE8:09 80 8D 10 D0 AC 3E 80 93
8EF0:84 FC A9 08 85 FD 20 9B 45
8EF8:84 A9 41 18 65 FC 8D 0F B5
8F00:D0 60 4C 53 46 2B 2D 4E E5
8F08:50 51 20 31 32 33 21 22 7D
8F10:23 0B 0C 02 13 45 40 42 95
8F18:48 44 27 8E 33 8E 42 8E 21
8F20:B4 8D D7 8D 9A 8D AD 8D C4
8F28:4D 8E FD 8C 56 8E 56 8E 42
8F30:56 8E 5E 8E 5E 8E 5E 8E 4B
8F38:50 8E 6E 8E 66 8E 6A 8E AA
8F40:3B 85 7B 86 7E 87 5B 83 82
8F48:0B 89 A9 12 8D 3F 80 A9 B9
8F50:00 8D 40 80 20 2B 8B 20 C7
8F58:FD 8C 20 7D 8C 20 AF 83 3D
8F60:8D 3C 80 A2 17 DD 02 8F 53
8F68:F0 05 CA 10 F8 30 EB 8A 86
8F70:0A AA BD 1A 8F 8D 7F 8F D9
8F78:BD 1B 8F 8D 80 8F 20 4A D4
8F80:8F 4C 5A 8F 00 00 00 00 BE
```

G

TAXPERFECT™

Get TaxPerfect™ now and relax on April 15th . . .



• SEVENTH SUCCESSFUL YEAR! • MANY THOUSANDS ALREADY IN USE!

• Your Simple Answer to the Tax Reform Act of 1986 (As Amended)

• TaxPerfect is the quick, correct, easy way to do your taxes • Absolutely up-to-date with the Tax Reform Act of 1986 and ***all*** new tax changes • Simplest tax return preparation program available — at any price • Single-keystroke form-to-form change • Automatically calculates and transfers data from every FORM and Schedule to FORM 1040 • Simply answer the questions — TaxPerfect calculates return, tax due or amount of refund due you • Automatically elects the greater of Standard or Itemized deductions • Prints data to all FORMS or Schedules you need for your complete return — ready to sign and file • Highly acclaimed by tax pros, CPA's and tax preparers, TaxPerfect is easy to understand and a pleasure to work with. Available for Commodore 64 and Commodore 128.

- TaxPerfect is fully screen-prompted, menu-driven and easy to use. System includes comprehensive User's manual with helpful tutorial example.
- With a single keystroke, TaxPerfect instantly recalculates your entire return when you change any item.
- TaxPerfect also prints directly onto IRS forms.
- TaxPerfect data files can be stored on disk.
- TaxPerfect yearly updates are available at 50% discount to registered TaxPerfect users.
- TaxPerfect is an essential addition to your personal software library — and best of all, it's tax deductible.

TAX PLANNING

• Most powerful program features available —at any price • Supports RAMdisk • Prints the input sheets to organize your data • Built-in calculator feature accumulates input and enters total • 32 PF key functions achieved with 1 or 2 keystrokes • Fast, complete tax calculations — 20 forms in under 2 seconds (most returns in under 1 second) • On-line pop-up Help menus • Full calculation-override capability • Follows IRS text & line #s **exactly** • Exclusive context-sensitive Datachek™ pinpoints omissions—and alerts you to effects of your input • Our exclusive Current Values Display constantly reflects all changes with your input • In Planning Mode all unnecessary text input prompts are eliminated. Only numeric input is prompted for.

RETURN PREPARATION

TaxPerfect PRINTS THE INCOME TAX RETURN FOR YOU: **TaxPerfect 64**—prints page 1 & page 2 of the FORM 1040 and Schedules A,B,C,D,E and SE as well as FORM 2441, 3903 and 6251 on standard IRS government forms or on blank computer paper for use with transparent overlays. **TaxPerfect 128**—supports all of the above forms ***plus*** Schedules F and R and FORMS 2106, 2119, 2210, 3800, 4136, 4255, 4562 and 4684. All other forms and schedules are considered in the calculation. TaxPerfect features direct screen input using fast ten-key style on the Commodore 128.

FULL-FEATURED DEPRECIATION SUPPORT

Self-contained Depreciation program calculates and prints complete listing of depreciable assets . . . all classes . . . any length life . . . traditional methods plus "old" rules, ACRS, MACRS . . . Half-year, mid-quarter & mid-month conventions. Schedule of assets attaches as a detailed, printed supplement to the FORM 4562.

Commodore 64 and Commodore 128 are TRADEMARKS of Commodore Business Machines Corp.

Complete 1989 Edition: TaxPerfect 64 **$89** TaxPerfect 128 **$99**

TO ORDER Call Toll Free **1-800-525-5611** 24 Hrs. from anywhere outside Dallas. In Dallas Call **214/386-6320.** MasterCard, VISA, Money Orders, Bank Checks and COD Orders Accepted (add 3% surcharge for credit card processing) (Texas residents add 8% sales tax) (add $5.00 for COD) ($5.00 Shipping)

Financial Services Marketing Corporation • 500 North Dallas Bank Tower • 12900 Preston Road • Dallas, Texas 75230

SOUND SAMPLER 64

Guy Johnson

Have you ever wanted to add sound effects to a program or to just experiment with the sound capabilities of your 64? This program handles all the tedious details for you, leaving you free to create. Joystick required. Printer recommended.

Let's face it: Creating sound effects on the 64 will never be as easy as plucking a string. The 64's Sound Interface Device, or SID, chip contains some 25 separate registers that control sound. Attempting to produce a particular effect by POKEing these registers is both tedious and time-consuming, especially for the novice programmer.

Now, *Sound Sampler 64* offers an alternative. This program allows you to access every programmable SID-chip register without prior computations or bothersome POKEs. Furthermore, it utilizes the full potential of the chip, including filtering and waveform control, and it even lets you print out the register values that you've chosen so that you can later enter them into your own programs.

Getting Started

Sound Sampler 64 is written entirely in BASIC. To ensure accurate entry, use *The Automatic Proofreader*, found elsewhere in this issue, as you type it in. When you've finished, be sure to save a copy of the program to tape or disk.

To begin creating sounds, simply plug a joystick into port 2; then load and run the program. A screen with four columns will appear. The first three columns contain parameters that control the SID chip's three voices. These include frequency values; attack, decay, sustain, and release rates; waveform types; and so on. The last column contains general parameters that apply to all three voices and include volume, high- and low-filter values, resonance, and filter type. The joystick is used to change the parameters.

Sound Sampler 64 has two modes: move mode, indicated by a blue screen border, and change mode, indicated by a yellow border. In move mode, use the joystick to move the cursor to the parameter you wish to set. In change mode, push the joystick up or down to increase or decrease the parameter the cursor is on. To switch between modes, press the fire button.

SOUND SAMPLER 64
VOICE #1 VOICE #2 VOICE #3 ALL 3
FRHI 9 FRHI 10 FRHI 4 CLR 0
FRLO 1 FRLO 1 FRLO 2 VOL 15
PULO 0 PULO 0 PULO 0 FILO 0
PUHI 0 PUHI 0 PUHI 0 FIHI 0
WVFM 16 WVFM 16 WVFM 16 RESO 0
ATAK 5 ATAK 3 ATAK 2 FIVO 0
DCAY 0 DCAY 6 DCAY 5 FITY 0
SUST 2 SUST 3 SUST 4 PLAY
RELS 1 RELS 1 RELS 1
PLAY 1 PLAY 1 PLAY 1
PRESS F1 TO PRINT

Sound Sampler 64's *powerful control panel.*

Voice Parameters

Let's take a closer look at the voice parameters in the first three screen columns. The first two—FRHI and FRLO—determine a sound's frequency or pitch; FRHI is the frequency's high byte, while FRLO is its low byte. Each parameter has a value in the range 0–255, for an overall frequency value of 0–65535. Adjust FRHI to make major changes in pitch, and use FRLO to fine-tune the sound. A table of frequency values for different musical notes is located in Appendix M of the *Commodore 64 User's Guide*.

The next two parameters, PULO and PUHI, are used to change the timbre of the sound for the pulse waveform. These parameters are only active for an individual voice when the pulse waveform is selected (see below). As with frequency, pulse is broken into a low byte (0–255) and a high byte (0–15). Change the first parameter to fine-tune the pulse, and the second to make major changes in it.

The waveform parameter (WVFM) determines the type of wave used to generate the sound. Possible values are 16, for a triangular waveform; 32, for a sawtooth waveform; 64, for a pulse waveform; and 128, for a random-noise waveform. Experiment with different waveforms to find the sound you like. (The pulse waveform requires that at least one of the pulse parameters above be set to something other than 0.)

The next four parameters are used to set a voice's sound envelope; each has a range of 0–15. The first, attack (ATAK), determines how quickly the sound reaches full volume—in as little as two milliseconds to as long as 8 seconds. Decay (DCAY) determines how fast the sound falls to sustain level; it varies from six milliseconds to 24 seconds. Sustain (SUST) is the volume at which the sound is held after the decay; it varies from 0–15, allowing you to set the voice's sustain volume in increments of 6⅔ percent of the overall volume. Release (RELS) is the rate at

which the sound falls from the sustain volume to 0; its values are similar to those of the decay cycle.

The final parameter is the PLAY parameter. When PLAY is set to 1, the corresponding voice is played. When it's set to 0, that voice is turned off (this doesn't always mean that no sound is heard). Before a voice can be heard, the following conditions must be met:

- The volume (see below) must be nonzero.
- A waveform must be selected.
- A frequency must be set.
- There must be an attack or a decay.

General Parameters

The parameters in the column on the right side of the screen affect all three voices. The clear parameter (CLR) sets all parameters on the screen to 0, so be careful when you use it. The volume parameter (VOL) controls how loud each voice is and ranges from 0 to 15.

There are four different filter parameters: FILO, FIHI, FIVO, and FITY (each one starts with *FI*). FILO (0–7) and FIHI (0–255) combine to determine the cutoff frequency. Depending on which filter type is used, these values cause the filter to attenuate all frequencies that are above, below, or near the cutoff point.

FIVO (0–7) determines which voices are affected by the filter. It is figured by adding up the values of the voices you want the filter to affect. Following is a table of the voice values for use with this parameter:

Voice Number	Value
Voice #1:	1
Voice #2:	2
Voice #3:	4

For example, let's say you want the filter to affect voices 1 and 3. To do this, set the FIVO parameter to 5 (1 + 4 = 5).

The last filter parameter is FITY (0–7). The 64 has three filter types: high pass, low pass, and band-pass. The high-pass filter removes lower frequencies, letting the higher frequencies pass. The low-pass filter has the opposite effect: It removes high frequencies while allowing low frequencies to pass. The band-pass filter allows a band or group of frequencies to pass through while frequencies above and below the band are removed. Set FITY to 4 for a high-pass filter, to 2 for a band-pass filter, or to 1 for a low-pass filter.

You can combine the filters to create some interesting effects. For example, suppose you want to combine the low- and high-pass filters to filter out midrange frequencies. To do this, set the FITY parameter to 5 (1 + 4 = 5).

The final parameter is RESO (0–15). Adjusting this increases or decreases the filter resonance.

The Finished Product

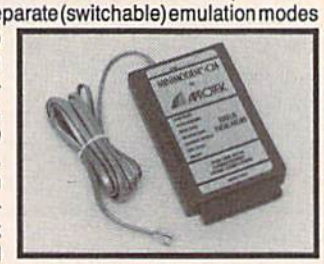
When you have developed the sound you like, turn on your printer and press f1. Label the project and each individual voice at the prompts. When you've finished, the program prints a table of values in "S+" notation. This means that the numbers in the first column are offsets from memory location 54272 (the starting SID chip address). So, to incorporate the sounds you create into your own program, for each register, add 54272 to the number in the first column; then POKE the value in the second column into this memory location.

Sound Sampler 64

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
SE 20 PRINT"{CLR}"TAB(12)"COPY
      RIGHT 1990":PRINTTAB(6)"
      COMPUTE! PUBLICATIONS, I
      NC."
RD 30 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED"
GM 40 FORJF=1TO2500:NEXT
JQ 50 DATA 4,14,24,34
MS 60 DATA 3,5,7,9,11,13,15,17
      ,19,21
AS 70 FOR Q=1TO4:READX:CR(Q)=X
      :NEXT
RC 80 FOR Q=1TO10:READX:LR(Q)=
      X:NEXT
MP 90 DIMZ(4,10)
QJ 100 POKE53281,0:POKE53280,1
      4
PH 110 PRINT"{CLR}{10 SPACES}
      {WHT} SOUND SAMPLER 64"
GG 120 PRINT:PRINT"{GRN}VOICE
      {SPACE}#1{2 SPACES}{3}V
      OICE #2{2 SPACES}{1}VOI
      CE #3{2 SPACES}{CYN}ALL
       3"
QR 130 PRINT"{YEL}"
QR 140 DATAFRHI,FRLO,PULO,PUHI
      ,WVFM,ATAK,DCAY,SUST,RE
      LS,PLAY
PP 150 FORQ=1TO10:READX$:FORQ2
      =1TO3:PRINTX$;"
      {6 SPACES}";:NEXTQ2:PRI
      NT:PRINT:NEXTQ
PR 160 DATACLR ,VOL ,FILO,FIHI
      ,RESO,FIVO,FITY,PLAY
MB 170 FORQ=1TO8:POKE214,LR(Q)
      :PRINT:POKE211,CR(4):RE
      ADX$:PRINT"{4 LEFT}"X$:
      NEXTQ
SX 180 PRINT"{8}"
CX 190 S=54272:FORQ=0TO24:POKE
      S+Q,0:NEXTQ:FORQ=1TO4:F
      ORQ2=1TO10:Z(Q,Q2)=0
JR 200 NEXT:NEXT
KJ 210 FORC=1TO3:FORL=1TO10:PO
      KE214,LR(L):PRINT:POKE2
      11,CR(C):PRINTZ(C,L);"
      {LEFT}{3 SPACES}"
AX 220 NEXT:NEXT
SE 230 FORQ=1TO8:POKE214,LR(Q)
      :PRINT:POKE211,CR(4):PR
      INT0;"{LEFT}{3 SPACES}"
      :NEXT
EQ 240 PRINT:PRINT"{DOWN}
      {11 RIGHT}{3 DOWN}PRESS
       F1 TO PRINT";
DJ 250 C=1:L=1
DF 260 REM{3 SPACES}** MOVEMEN
      T LOOP **
XK 270 POKE214,LR(L):PRINT:POK
      E211,CR(C):PRINT"{RVS}"
      Z(C,L)"{LEFT} {OFF}";:P
      OKE211,CR(C)
HP 280 JS=PEEK(56320)
MP 290 GETA$:IFA$=CHR$(133)THE
      N1030:REM PRINT
GQ 300 IFJS=127THEN280
JR 310 IFJS=111THENPOKE53280,7
      :FORJS=0TO199:NEXT:GOTO
      450
KC 320 PRINT"{OFF}"Z(C,L);"
      {LEFT}{2 SPACES}"
QK 330 IFJS=126THENL=L-1:REM U
      P
XX 340 IFJS=125THENL=L+1:REM D
      OWN
GH 350 IFJS=123THENC=C-1:REM L
      EFT
AX 360 IFJS=119THENC=C+1:REM R
      IGHT
DE 370 IFL>10THENL=10
KP 380 IFL<1THENL=1
JQ 390 IF(C=4)AND(L>8)THENL=8
QS 400 IFC<1THENC=1
CH 410 IFC>4THENC=4
SP 420 IF(L>8)AND(C>3)THENC=3
BX 430 GOTO270
GE 440 REM{3 SPACES}**
      {4 SPACES}CHANGE LOOP
      {4 SPACES}**
DE 450 IFC=4THEN870
RR 460 IFL=1THENM=S+1:F=0:T=25
      5:GOTO560
BB 470 IFL=2THENM=S:F=0:T=255:
      GOTO560
ES 480 IFL=3THENM=S+2:F=0:T=25
      5:GOTO560
FH 490 IFL=4THENM=S+3:F=0:T=15
      :GOTO560
JM 500 IFL=5THEN680
KQ 510 IFL=6THENM=S+5:F=2:P=Z(
      C,7):T=15:GOTO560
PS 520 IFL=7THENM=S+5:F=1:P=Z(
      C,6):T=15:GOTO560
MH 530 IFL=8THENM=S+6:F=2:P=Z(
      C,9):T=15:GOTO560
QK 540 IFL=9THENM=S+6:F=1:P=Z(
      C,8):T=15:GOTO560
BD 550 IFL=10THEN820
XJ 560 JS=PEEK(56320)
ED 570 IFJS=127THEN560
FH 580 IFJS=125THENZ(C,L)=Z(C,
      L)-1:GOTO620
MC 590 IFJS=126THENZ(C,L)=Z(C,
      L)+1:GOTO620
GX 600 IFJS=111THENPOKE53280,1
      4:FORJS=0TO199:NEXT:GOT
      O260
XQ 610 GOTO560
AD 620 IFZ(C,L)>TTHENZ(C,L)=0:
      POKE211,CR(C):PRINT"
      {5 SPACES}";:GOTO640
SB 630 IFZ(C,L)<0THENZ(C,L)=T:
      GOTO640
GD 640 IFF=0THENPOKEM+(C-1)*7,
      Z(C,L):GOTO670
RQ 650 IFF=1THENPOKEM+(C-1)*7,
      P+Z(C,L):GOTO670
KD 660 IFF=2THENPOKEM+(C-1)*7,
      P+Z(C,L)*16
HM 670 POKE211,CR(C):PRINT"
      {RVS}";Z(C,L);"{LEFT}
      {OFF} ";:GOTO560
RX 680 REM ** WAVEFORM CHANGE
      {SPACE}**
BB 690 JS=PEEK(56320)
RX 700 IFJS=127THEN690
XP 710 IFJS=125THEN750
BX 720 IFJS=126THEN780
GD 730 IFJS=111THENPOKE53280,1
      4:FORJS=0TO199:NEXT:GOT
      O270
QH 740 GOTO690
```

NEW! MINIMODEM-C24™ ONLY $99.95

What's included? Everything! You don't need to worry about cables, compatibility or anything else! Aprotek Minimodem-Cs™ plug directly into your Commodore C-64, C-64C or C-128 USER port. Both are unique in that they have two separate (switchable) emulation modes (Hayes and Commodore 1670®) to make them compatible with ALL available software. Minimodem-Cs™ are full feature, modems with Auto Answer, Auto Dial, Touch-Tone or rotary dialing, have status lights and a built-in speaker. Just plug into your computer and standard phone jack with the attached cable. Supplied with software and includes a trial subscription to Compuserve.



Do you have or plan to get another computer? We have your solution. Order our ComModem™ adapter (#5100 below) along with either Minimodem-H,™ used with any computer that has a RS-232 serial port as well as with your Commodore. Aprotek Minimodems™ are tiny. Only 4¾" long, 2¾" wide and ¾" high. Our highly integrated, state-of-the-art circuitry makes our modems the best on the market and a very smart buy.

Built with pride in the USA and fully guaranteed for 1 year.

Order #	Item	Price	Shipping	Total
6412	MINIMODEM-C24™ (2400B Commodore)	99.95	_____	_____
6414	MINIMODEM-H24™ (2400B RS-232 w/male DB-25)	99.95	_____	_____
6216	MINIMODEM-AM24™ (AMIGA 500/2000 SELF PWD)	99.95	_____	_____
6212	MINIMODEM-C™ (1200B Commodore)	64.95	_____	_____
6214	MINIMODEM-H™ (1200B RS-232, specify M/F)	74.95	_____	_____

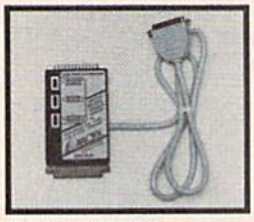
Modem shipping—Cont. US $6.00; UPS Blue, CAN, AK, HI, APO $10.00

The Original Aprospand-64™

Gives your Commodore 64 or 128 full expandability! This superbly designed expansion module plugs into the expansion port and gives you four switchable expansion connectors—plus fuse protection—plus a reset button! Before you buy an expander, be sure that it has a fuse to protect your computer.

Order #5064 . . . . . ONLY $29.95 + S&H

UNIVERSAL RS-232 INTERFACE



Connect and communicate with any of the popular RS-232 peripherals using your Commodore **USER** Port. You can now connect to printers, modems and any other RS-232 device. Comes complete with sample driver program listings. Compatible with all Commodore home computers with a USER port. 1-year warranty.

Order #5232 . . . . . $39.95 + S&H

"COM-MODEM" ADAPTER — Plug directly into USER port and connect to any RS-232 modem. **Order #5100 . . $19.95 + S&H**

"USER EXTENDER" — 10" Ribbon cable extender for your Commodore USER port. **Order #5250 . . . . . $21.95 + S&H**

Shipping per each above item: Cont. US = $4.Can, PR, HI, AK, APO, UPS Blue = $6

SEE YOUR COMMODORE DEALER OR ORDER DIRECT. DIRECT ORDER INFORMATION. All prices are cash prices—VISA and MC add 3% to total. We ship the next business day on money orders, cashier's checks, and charge cards. 14-day clearing period for checks. Prices and availability subject to change—CALL. Dealer inquiries invited. **1 year warranty plus a 2 week satisfaction or your money back trial period on all products.**

To Order Call: 800/962-5800 (8-5 PST)

For answers and information call:
Aprotek BBS Answerline 503-855-9147: 1200 or 2400 Baud, 24 hours

Or send order to:

WE'VE MOVED!

APROTEK
Dept. CG
9323 W. Evans Creek Rd.
Rogue River, OR 97537

Circle Reader Service Number 127

Sound Sampler

```
AR 750 IFZ(C,L)=0THENZ(C,L)=128:GOTO770
HA 760 Z(C,L)=Z(C,L)/2:IFZ(C,L)<16THENZ(C,L)=
       0
RB 770 POKES+4+(C-1)*7,Z(C,L):POKE211,CR(C):P
       RINT"{RVS}";Z(C,L);"{LEFT} {OFF} ";:GO
       TO680
RM 780 IFZ(C,L)=0THENZ(C,L)=16:GOTO810
XH 790 Z(C,L)=Z(C,L)*2
CC 800 IFZ(C,L)>128THENZ(C,L)=0:POKE211,CR(C)
       :PRINT"{RVS}";Z(C,L);"{LEFT} {OFF}
       {2 SPACES}";
SX 810 POKES+4+(C-1)*7,Z(C,L):POKE211,CR(C):P
       RINT"{RVS}";Z(C,L);"{LEFT} {OFF} ";:GO
       TO680
CK 820 POKE53280,14:REM PLAY A VOICE
CP 830 IFZ(C,L)=0THENPOKES+4+(C-1)*7,Z(C,5)+1
       :GOTO860
XB 840 POKES+4+(C-1)*7,Z(C,5):Z(C,L)=0:POKE21
       1,CR(C):PRINT"{RVS}";Z(C,L);"{LEFT}
       {OFF}";
CP 850 GOTO260
ME 860 Z(C,L)=1:POKE211,CR(C):PRINT"{RVS}";Z(
       C,L);"{LEFT} {OFF}";:GOTO260
XM 870 REM{3 SPACES}** ALL VOICES COLUMN **
XE 880 IFL=1THENPOKE53280,14:GOTO190
CP 890 IFL=2THENM=S+3:F=1:P=Z(C,7):T=15:GOTO5
       60
QX 900 IFL=3THENM=S:F=0:T=7:GOTO560
MJ 910 IFL=4THENM=S+1:F=0:T=255:GOTO560
CJ 920 IFL=5THENM=S+2:F=2:P=Z(C,6):T=15:GOTO5
       60
JC 930 IFL=6THENM=S+2:F=1:P=Z(C,5):T=7:GOTO56
       0
KM 940 IFL=7THEN1190:REM ELSE PLAY ALL VOICES
GM 950 POKE214,LR(10):PRINT:FORG=0TO2:POKES+4
       +G*7,Z(G+1,5):POKE211,CR(G+1)
MJ 960 PRINT0"{LEFT} ";:Z(G+1,10)=0:NEXT
RB 970 IFZ(C,L)=1THENZ(C,L)=0:POKE214,LR(8):P
       RINT:GOTO990
XS 980 GOTO1000
AK 990 POKE211,CR(C):PRINT"{RVS}";Z(C,L);"
       {LEFT} {OFF} ";:POKE53280,14:GOTO260
EQ 1000 POKE214,LR(10):PRINT:FORG=0TO2:POKES+
       4+G*7,Z(G+1,5)+1:POKE211,CR(G+1)
HC 1010 PRINT1;"{LEFT} ";:Z(G+1,10)=1:NEXT
GH 1020 POKE214,LR(8):PRINT:Z(C,L)=1:GOTO990
FD 1030 REM PRINT IT
FG 1040 PRINT"{CLR}{3 DOWN}":INPUT"ENTER TITL
       E:";Y$(0):PRINT
QR 1050 INPUT"ENTER NAME OF VOICE 1:";Y$(1)
SE 1060 PRINT:INPUT"ENTER NAME OF VOICE 2:";Y
       $(2)
XS 1070 PRINT:INPUT"ENTER NAME OF VOICE 3:";Y
       $(3)
EM 1080 PRINT:PRINT"PRINTING..."
RA 1090 OPEN4,4:PRINT#4,"SOUND SAMPLE: ";Y$(0
       ):PRINT#4,""
QR 1100 PRINT#4,"S=54272. REG'S GIVEN IN 'S+'
        NOTATION:"
RA 1110 FORN=1TO3:PRINT#4,Y$(N):FORN2=0TO4:PR
       INT#4,(N-1)*7+N2;": ";Z(N,N2+1)
JR 1120 NEXTN2:PRINT#4,5+(N-1)*7;": ";Z(N,6)*
       256+Z(N,7)
MR 1130 PRINT#4,6+(N-1)*7;": ";Z(N,8)*256+Z(N
       ,9):NEXTN
DC 1140 PRINT#4,"":PRINT#4,21;": ";Z(4,3)
HM 1150 PRINT#4,22;": ";Z(4,4)
JA 1160 PRINT#4,23;": ";Z(4,5)+Z(4,6)
HQ 1170 PRINT#4,24;": ";Z(4,2)+Z(4,7)*16
KJ 1180 CLOSE4:PRINT"DONE!":END
CD 1190 REM ADJUST FILTER TYPE
QB 1200 JS=PEEK(56320):IFJS=127THEN1200
DE 1210 IFJS=111THENPOKE53280,14:FORJS=0TO199
       :NEXT:GOTO270
PS 1220 IFJS=125THENZ(C,L)=Z(C,L)-1:GOTO1250
JQ 1230 IFJS=126THENZ(C,L)=Z(C,L)+1:GOTO1250
BR 1240 GOTO1200
CE 1250 IFZ(C,L)>7THENZ(C,L)=0
PD 1260 IFZ(C,L)<0THENZ(C,L)=7
GA 1270 POKES+24,Z(C,2)+Z(C,L)*16:POKE211,CR(
       C):PRINT"{RVS}";Z(C,L);"{LEFT} {OFF}
       {SPACE}";
RS 1280 GOTO1200
```

G

Lyco Computer
Marketing & Consultants

Since 1981

PRINTERS

Star NX-1000 Series II

•180 cps draft • 45 cps NLQ • four resident fonts • 216x240 dpi resolution and print pitches ranging from 3 to 20 cpi

$169.95

Panasonic

1180	$169.95*
1191	$215.95
1124	$285.95
1592	$CALL
1595	$CALL
1524	$CALL
1600 Series	$NEW
1624	$439.95

* Quantities Limited

Citizen 120 D

•120 cps draft speed with improved throughput capabilities •Built-in variable-width tractor•compact design w/bottom paper feed minimize space requiremnts.

$138.95

Star

NX-1000 Color	$209.95
NX-1000C	$159.95
NX-1000C Color	$209.95
NX-1000 Series II	$169.95
NX-2400	$274.95

Epson

LX-810	$184.95
LQ-510	$319.95
FX-850	$339.95
FX-1050	$439.95
LQ-850	$514.95
LQ-950	$529.95

Panasonic KX-P1180

•9-Pin personal printer • EZ-Set operator panel • adjustable push/pull tractor feed • multiple paper paths • 192 cps draft • 38 cps NLQ

$169.95*

* Quantities Limited

Printer ribbons, cables, connections and accessories available for all applications. Please Call.

Citizen

120 D	$138.95
180 D	$154.95
HSP-500	$315.95

Brother

1809	$349.95
M1724L	$519.95
1824L	$469.95

Okidata

Okimate 20w/cart	$194.95
172	$195.95
182 Turbo	$229.95
183	$219.95
320	$329.95
321	$459.95

COMMODORE SOFTWARE

Access:

Echelon	$28.95
Mach 128	$29.95
Mach 5	$22.95

Activision:

Maniac Mansion	$23.95
Neuromancer	$25.95
Rampage	$22.95

Berkeley Softworks:

Geofile 64	$29.95
Geos 64 2.0	$35.95
Geos 128 2.0	$39.95
Geopublish	$29.95
Geofile 128	$39.95

Broderbund:

Print Shop	$28.95
Print Shop Comp	$22.95
GraphicLib1,2,3,ea	$15.95
Carmen San Diego WI	$22.95
Carmen San Diego US	$25.95

*** Call for New Titles ***

Microprose:

Gunship	$25.95
Stealth Fighter	$28.95
Red Storm Rising	$28.95

Origin:

Ultima IV	$38.95
Ultima V	$38.95

Timeworks:

Swiftcalc 128	$31.95
Data Manager 2-64	$12.95
Data Manager 128	$28.95
Word Writer 128	$31.95

ACCESSORIES

Joysticks:

Boss	$12.95
Bathandle	$16.95
i Controller	$12.95
3-Way	$22.95

Diskettes:

5¼ Disk Notcher	$5.95
Xidex 5¼ DSDD	$4.95
Xidex 3½ DSDD	$9.95

Surge Protectors:

QVS PP-102	$15.95
QVS PP-112	$15.95
QVS PP-104	$23.95

Printer Interfaces:

Xetec Jr.	$35.95
Xetec Supergraphics	$55.95
Xetec Gold	$74.95
MW 350	$49.95

Printer Paper:

1000 sheet laser	$16.95
Banner Paper 45' Roll	$10.95

Drive Maintenance:

5¼ Drive Cleaner	$4.95
3½ Drive Cleaner	$4.95

COMMODORE UPGRADES

MAGNAVOX CM8762

- 13" diagonal RGB/Composite Color Display
- Green text switch
- Built-in tilt stand
- Interface cables included

$234.95

GoldStar 2105 A

- 12" amber display
- 640h x 200v
- IBM and Commodore compatible

$74.95

Excel FSD-2 + Disk Drive

100% Commodore 64C drive compatible, the Excelerator Plus Disk Drive is quieter, smarter, faster, and more reliable than the 1541 and 1541C. *1-year warranty*

$139.95

MONITORS

Magnavox:

BM7652 Mon. Comp	$84.95
BM7622 Mon. Comp	$84.95
CM8702 Color Comp	$189.95
CM8762 RGB	$234.95
8CM-515 RGB	$249.95

GoldStar:

2105 A Composite	$74.95
1410 CGA 14"	$214.95
1420 EGA 14"	$319.95
1430 VGA 14"	$349.95

MODEMS

Cardinal:

MB2400EX EXT	$109.95
MB1200EX EXT	$69.95

Everex:

Evercom 12 (INT)	$54.95
Evercom 24 (INT)	$119.95
Evercom 24+ MNP	$149.95
Evercom 24E+ MNP	$199.95

Avatex:

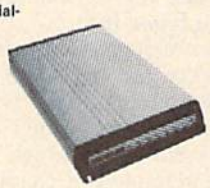
1200e	$64.95
1200hc	$94.95
2400	$129.95

HARDWARE

64C Computer	$129.95
C 128 D Computer Drive	$418.95
1541 II Disk Drive	$174.95
Colt PC	$639.95
1670 Modem	$59.95

Cardinal MB2400EX External Modem

- Low error data transmission and reception over standard dial-up telephone lines
- Hayes compatible with the universally-accepted AT command set
- Automatic Data Standard and Speed Adjust features



$109.95

64 Power Supply

The MW 701-A power supply made by Micro R&D features double fused systems, schematics, and a one-year warranty. Stay with the best, stay with Micro R&D.

$34.95

"Our friendly sales staff can help with any questions you have"

Why shop at Lyco Computer? Lyco Computer offers quality name brand computer products at prices 30% to 50% below retail. If you do not see the product you want advertised, call Lyco Marketing toll free. ***How do I know I will get the product I need?*** Our marketing staff receives continous formal training by our manufacturers. As thousands of people every week capitalize on our savings and services, we hope you too, will make Lyco Computer your first choice. ***What about warranty or service?*** Our Customer Service Department is available at (717) 494-1670 to assist you. We back all of our manufacturer's stated warranty terms. Before returning any item that appears to be defective, we ask that you call our Customer Service Department. ***Will you rush an item to me?*** We offer next day air, two day air, standard UPS, and postal international shipping services. Temporary shortages are normally filled within 10 days. ***How do I order?*** We have always accepted C.O.D. orders through UPS. Prepaid cash orders over $50 are shipped freight-free. For orders under $50, please add $3 for freight. Personal and company checks require a 4 week waiting period. Visa and Master Card orders are accepted. Please add 4% for credit cards. Purchase orders are accepted from Educational Institutions. We charge sales tax on deliveries in Pennsylvania. For APO, FPO, and international orders, add $5 plus 3% for priority mail. Prices in this ad reflect cash prices. Advertised prices and availability are subject to change. Simply send your order to Lyco Computer, P.O. Box 5088, Jersey Shore, PA, 17740. Or, call 1-800-233-8760 or (717) 494-1030. Not responsible for typographical errors.

Sales: 1-800-233-8760 or 717-494-1030
Hours: Mon.-Fri. 9a.m.-9p.m. Sat.10a.m.- 6p.m.
Customer Service:
717-494-1670
Hours: Mon.-Fri. 9a.m.-5p.m.
Fax: 717-494-1441

MasterCard VISA

ATTENTION EDUCATIONAL INSTITUTIONS:
If you are not currently using our educational service program, please call our representatives for details.

1-800-233-8760

Price Guarantee

Since 1981 we have led the industry by continuing to offer the lowest personal prices while providing quality service. Many companies have come and gone trying to imitate our quality and service. If by some oversight we do not have the lowest prices advertised on the products you desire then we would appreciate the opportunity to rectify the oversight!

Circle Reader Service Number 129

MESSENGER

Stephane Edwardson

Here's a fun way to send a message to a friend: Generate a stand-alone text file that recreates your actual type-in sequence. For the 64.

Need to add a personal touch to your notes, online messages, or program instruction files? *Messenger* just may be your answer. It lets you enter a message using the built-in screen editor and then save it to disk in the form of a BASIC program. When you run this program, your message is displayed on the screen one keystroke at a time, exactly as you typed it in.

Because *Messenger* uses the screen editor, you can produce some interesting and entertaining effects with it. In addition to letting you enter ordinary text and graphics characters, you can cursor around the screen, change screen colors, change text colors, and so forth. With a 31K buffer and a built-in message compactor, *Messenger* is capable of handling lengthy dispatches. It can also "grab" text from sequential files on disk and incorporate it into your message.

Getting Started

Messenger is written in BASIC with machine language routines in DATA statements. Enter the program using *The Automatic Proofreader*, found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program to disk.

When you're ready to begin, load and run *Messenger*. After the program initializes, you're presented with a menu of eight options. At the bottom of the screen is a handy memory gauge which tells you the length of the current message and the amount of memory still available.

Using the Program

The first menu option is View Message. This option lets you preview the message that's currently in the text buffer. During the playback sequence, you can press the Commodore key to speed up the process or the SHIFT/LOCK key to pause the display.

The second menu option is Enter Message. Select this option when you wish to edit an existing message or create a new one. If there's currently a message in the text buffer, it will be played back (using Option 1) before you're placed in edit mode. Once in this mode, you can move the cursor around, type in text, change screen colors, or do whatever you like.

The built-in screen editor is active, so practically any keystroke is allowed. As you type in your message, the program takes each keypress and stores its corresponding CHR$ value in the text buffer. The only keys that behave differently are the function keys, which have the following assignments:

f1 Cycles the border colors
f2 Inserts a one-second pause in the message
f3 Cycles the screen colors
f4 Resets the screen, border, and text colors
f5 Enables uppercase/graphics character set
f7 Enables lower-/uppercase character set
f8 Exits edit mode and returns you to the main menu

When you've finished typing in your message, press f8 to return to the main menu. Also, if you're typing in a large message, it's a good idea to periodically check the amount of free memory available. To do this, press f8, note the memory gauge, and then return to edit mode by selecting Option 2.

The third option is Make Message Program. This option lets you convert the buffer contents into a stand-alone message file. Use this option only after you've edited your message and are completely satisfied with it. When you select this option, you'll be prompted for a password (eight characters or less). This password will be encoded into your text file and only those who can supply it will be able to read your message. If you don't want a password-encoded text file, just press RETURN at the prompt.

Next, enter a filename (16 or fewer characters) for your message file or press RETURN to abort this option and return to the main menu. If you enter a filename, your message is compressed (see Option 4) and then saved to disk in a ready-to-run format.

The fourth option is Compact Memory. This option is used to crunch the data within the text buffer to conserve memory and disk space. Whenever a character occurs more than two

times consecutively within the message, the compactor routine inserts a special code or token in the message and compresses the repeating characters into a two-byte sequence. Using this approach, up to 255 repeating characters can be stored in two bytes. Note that this option executes automatically before a message is saved to disk in the stand-alone format (Option 3).

Option 5 is Save Message Text. Use this option to save incomplete messages or to store files for future reference. When you select this option, you'll be prompted for a filename. If you wish to abort the option, just press RETURN at the prompt. If you choose to continue, enter a filename and the contents of the text buffer will be saved to disk as a sequential file. Note that the message isn't compacted before the save, so if you want to conserve disk space, execute Option 4 before this one.

The sixth option, Load Message Text, performs the opposite of Option 5. It loads previously saved text files (both compacted and uncompacted) or any sequential text file containing Commodore ASCII text. Text that's loaded with this option will be appended to the text buffer.

When you choose Option 6, a directory of sequential files on the disk in the drive is displayed. Next, you're prompted for the name of the file you wish to load. Enter a filename or press RETURN to abort the option.

If you wish to include a BASIC program listing in your message, you must first convert the program file to a sequential file and then later append it to the message. To perform this conversion, load the program into memory and then type the following command sequence:

```
OPEN 1,8,8,"0:filename.seq,S,W":CMD1:
  LIST
PRINT#1:CLOSE1
```

where *filename.seq* is the name of the sequential file that you're creating.

Option 7, the Clear Memory option, is used to clear the contents of the text buffer. Be careful with this option; once you've cleared the buffer, there's no way to recover the data.

The last option, Option 8, is Quit. This option exits *Messenger* and resets the computer. Be sure that you save all data before selecting this option.

Special Effects

Using the standard Commodore screen editor, you can create some rather impressive and interesting effects. By using the INST/DEL key to push and pull words around, you can make text appear to dance across the screen. To give different portions of your message emphasis, you can cycle the text, screen, and border colors. By pressing f5 or f7, you can alternate between the two character sets.

Scrolling effects can be achieved in a number of ways. One way is to type in your message at the bottom of screen and then press the RETURN key several times. The text will move up one screen line each time you press RETURN. Downward scrolling can be performed by typing your message at the top of the screen, erasing it, typing it again on the next line, and so on. This method may seem a little tedious, but the results are worth it.

These examples represent only a small sample of what you can do with *Messenger*. With a little creativity and some experimentation, you'll be creating dazzling messages in no time.

Messenger

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
MH 20 POKE55,0:POKE56,PEEK(46)
      +4:CLR:PRINT"{CLR}{DOWN}
      {CYN}"TAB(9)"ONE MOMENT,
       PLEASE..."
DS 30 POKE53280,0:POKE53281,0:
      POKE650,128:DIMA(70)
RS 40 FORZ=0TO9:A(Z+48)=Z:A(Z+
      61)=Z+6:NEXT:FORZ=1TO7:R
      EADB:NEXT
XM 50 FORZ=49152TO49879:READA$
      :Q=16*A(ASC(A$))+A(ASC(R
      IGHT$(A$,1))):G=G+Q
AB 60 POKEZ,Q:NEXT:IFG<>95982T
      HENPRINT"{DOWN}ERROR IN
      {SPACE}DATA STATEMENT.":
      STOP
JC 70 CLR:SYS49195:DEFFNA(X)=P
      EEK(X)+256*PEEK(X+1)
JS 80 AD=FNA(55):U$=CHR$(8)+CH
      R$(142):N=AD:POKEN,0:W=4
      0959
XQ 90 IFN>WTHENN=W:POKEW,0
RF 100 POKE53280,0:POKE53281,0
       :PRINT"{CLR}";U$;:MB=N-
       AD:FB=W-N
PM 110 A$="":FORZ=1TO29:A$=A$+
       "*":NEXT:B$="{DOWN}
       {6 RIGHT}{RVS}{7} ":C$=
       " {OFF}{YEL} "
PA 120 PRINTTAB(15)"{7}MESSENG
       ER{4}":PRINTTAB(12)"COP
       YRIGHT{2 SPACES}1990"
PQ 130 PRINTTAB(6)"COMPUTE! PU
       BLICATIONS, INC."
BS 140 PRINTTAB(11)"ALL RIGHTS
        RESERVED"
AE 150 PRINT"{BLU}{DOWN}
       {5 RIGHT}{A}"A$"{S}":FO
       RZ=1TO8:PRINT"{5 RIGHT}
       -"TAB(35)"-":PRINT"
       {5 RIGHT}{Q}"A$"{W}"
CP 160 NEXT
QR 170 PRINT"{UP}{5 RIGHT}{Z}"
       A$"{X}{HOME}{4 DOWN}"
QJ 180 PRINTB$"1"C$"VIEW MESSA
       GE"
RK 190 PRINTB$"2"C$"ENTER MESS
       AGE"
GD 200 PRINTB$"3"C$"MAKE MESSA
       GE PROGRAM"
QD 210 PRINTB$"4"C$"COMPACT ME
       MORY"
BQ 220 PRINTB$"5"C$"SAVE MESSA
       GE TEXT (SEQ)"
QQ 230 PRINTB$"6"C$"LOAD MESSA
       GE TEXT (SEQ)"
XB 240 PRINTB$"7"C$"CLEAR MEMO
       RY"
XD 250 PRINTB$"8"C$"QUIT"
RH 260 PRINT,,"{8}{2 DOWN}";RI
       GHT$(STR$(FB+1E6),5);"
       {CYN} BYTES FREE"
JA 270 PRINT,,"{8}";RIGHT$(STR
       $(MB+1E6),5);"{CYN} BYT
       ES USED";:POKE198,0
MP 280 GETA$:IFA$<"1"ORA$>"8"T
       HEN280
CC 290 ONVAL(A$)GOTO300,360,35
       0,470,480,550,310,330
GF 300 SYS49192,AD:FORZ=1TO500
       :NEXT:GOTO90
QQ 310 GOSUB740:IFA$="N"THEN90
HS 320 N=AD:POKEN,0:GOTO90
ES 330 GOSUB740:IFA$="N"THEN90
KX 340 SYS64738
SF 350 GOSUB890:GOTO90
AH 360 SYS49192,AD:FORZ=54272T
       O54300:POKEZ,0:POKE5429
       6,15
BG 370 RESTORE:FORZ=6TO0STEP-1
       :READY:POKE54272+Z,Y:NE
       XT:POKE198,0
SD 380 B=54276:C=53280:D=C+1:A
       =USR(0):POKEB,33:POKEB,
       255:POKEN,A:N=N+1
JK 390 IFA<133ORA>140THEN460
RK 400 IFA=133THENPOKEC,(PEEK(
       C)AND15)+1
KR 410 IFA=134THENPOKED,(PEEK(
       D)AND15)+1
XF 420 IFA=138THENPOKEC,0:POKE
       D,0:PRINT"{CLR}{CYN}";U
       $;
KX 430 IFA=135THENPRINTU$;
KE 440 IFA=136THENPRINTCHR$(14
       );
SD 450 IFA=140THENN=N-1:POKEN,
       0:GOTO90
ME 460 PRINTCHR$(A);:GOTO380
PK 470 GOSUB1050:GOTO90
PE 480 PRINT"{CLR}"TAB(15)"
       {DOWN}{6}TEXT SAVE"
JD 490 F$="":INPUT"{4 DOWN}
       {CYN}FILENAME ";F$:IFF$
       =""THEN90
EF 500 GOSUB860:PRINT"{CLR}
       {5 DOWN}"TAB(10)"{6}SAV
       ING...PLEASE WAIT"
JC 510 OPEN2,8,2,F$+",S,W":GOS
       UB800:IFER<>0THEN540
RA 520 IFPEEK(AD)<>138THENPRIN
       T#2,CHR$(138);
EC 530 SYS49201,AD
RX 540 CLOSE2:CLOSE15:SYS65511
       :GOTO90
DJ 550 GOSUB860:S$="":FORZ=1TO
       40:S$=S$+" ":NEXTZ
QK 560 PRINT"{CLR}{6}"TAB(10)"
       FILES ON THIS DISK:
       {DOWN}{6}{GRN}"
XX 570 OPEN2,8,0,"$0:*=S":C$=C
       HR$(34):GOSUB800:IFER<>
       0THEN730
FH 580 GET#2,A$,A$
MK 590 GET#2,A$,A$:IFA$=""THEN
       680
CM 600 GET#2,A$,A$:N$=""
EG 610 GET#2,A$:IFA$=""THEN590
KS 620 IFA$<>C$THEN610
EX 630 GET#2,A$:IFA$<>C$THENN$
       =N$+A$:GOTO630
AX 640 IFZ=41THENZ=0:PRINT"
       {RVS}"LEFT$(N$+S$,40)"
       {6}{OFF}";:GOTO660
HK 650 PRINTN$;SPC(20-LEN(N$))
       ;
BQ 660 GET#2,A$:IF A$<>"" THEN
       660
```

```
DD 670 GOTO590
QH 680 CLOSE2:CLOSE15:PRINT:PR
       INT"{RVS}{GRN}";S$
SR 690 F$="":INPUT"{CYN}{DOWN}
       FILE TO LOAD ";F$:IFF$=
       ""THEN730
JH 700 PRINT"{CLR}{5 DOWN}"TAB
       (10)"{6}LOADING...PLEAS
       E WAIT"
EM 710 OPEN2,8,2,F$+",S,R":GOS
       UB800:IFER<>0THEN730
AC 720 SYS49198,N:N=FNA(781)+1
       :POKEN,0
JP 730 CLOSE2:CLOSE15:SYS65511
       :GOTO90
QC 740 PRINT"{CLR}"TAB(15)"
       {YEL}{2 DOWN}WARNING!!!
       "
FX 750 PRINT"{2 DOWN}{CYN}
       {3 SPACES}THIS OPTION W
       ILL ERASE THE CURRENT"
PC 760 PRINTTAB(11)"{DOWN}MESS
       AGE IN MEMORY."
ME 770 PRINTTAB(10)"{3 DOWN}
       {6}ARE YOU SURE? [Y/N]"
       :POKE198,0
JM 780 GETA$:IFA$<>"Y"ANDA$<>"
       N"THEN780
KK 790 RETURN
XQ 800 OPEN15,8,15:INPUT#15,ER
       ,ER$,ET,ES:IFER=0THENRE
       TURN
RP 810 PRINT"{CLR}"TAB(11)"
       {2 DOWN}{6}OPERATION AB
       ORTED."
QA 820 PRINT"{7 DOWN}{RED}DISK
        ERROR:{YEL}";ER;ER$;ET
       ;"{LEFT}";ES
FE 830 PRINTTAB(14)"{6}
       {7 DOWN}PRESS A KEY":PO
       KE198,0
CA 840 GETA$:IFA$=""THEN840
SM 850 RETURN
CA 860 PRINT"{CLR}{6}{5 DOWN}"
       TAB(5)"INSERT A DISK AN
       D PRESS A KEY":POKE198,
       0
ES 870 GETA$:IFA$=""THEN870
CX 880 RETURN
JS 890 A=AD:PRINT"{CLR}{CYN}
       {5 DOWN}"
SD 900 FORZ=1TO8:KY(Z)=0:NEXT:
       Q=1
CK 910 PRINT"INPUT PASSWORD TO
        CODE THE MESSAGE.
       {5 SPACES}{6}[RETURN]
       {CYN} ONLY TO NOT CODE"
MB 920 K$="":INPUT"{DOWN}PASSW
       ORD (8 CHARACTERS MAX.)
       ";K$
MK 930 P=1:IFK$=""THENK$=CHR$(
       0):P=0
JE 940 FORZ=1TO3:K$=K$+K$:NEXT
       :F$="":INPUT"{DOWN}FILE
       NAME";F$:IFF$=""THENRET
       URN
XX 950 GOSUB860:PRINT"{CLR}{6}
       {5 DOWN}{3 SPACES}COMPA
       CTING AND SAVING THE ME
       SSAGE."
SB 960 PRINTTAB(14)"{CYN}
       {2 DOWN}PLEASE WAIT.
       {3 DOWN}"
ME 970 GOSUB1060:OPEN2,8,2,F$+
       ",P,W":GOSUB800:IFER<>0
       THEN1040
HG 980 PRINT#2,CHR$(1)CHR$(8);
       :X=2049
PF 990 X=FNA(X):IFFNA(X+2)<>20
       00THEN990
CQ 1000 FORZ=XTOFNA(45)-1:PRIN
        T#2,CHR$(PEEK(Z));:NEX
        T
JJ 1010 PRINT#2,CHR$(P);:FORZ=
        1TO8:POKE49183+Z,0:NEX
        T
GB 1020 FORZ=49152TO49615:PRIN
        T#2,CHR$(PEEK(Z));:NEX
        T
PB 1030 FORZ=1TO8:POKE49183+Z,
        ASC(MID$(K$,Z,1)):NEXT
        :SYS49207,AD:POKE49184
        ,0
SF 1040 CLOSE2:CLOSE15:SYS6551
        1:RETURN
BG 1050 PRINT"{CLR}{6}"TAB(8)"
        {5 DOWN}COMPACTING...
        {SPACE}PLEASE WAIT
        {3 DOWN}"
XX 1060 IFN=ADTHENRETURN
XA 1070 SYS49204,AD:N=FNA(781)
        :RETURN
HX 1080 DATA255,31,255,1,0,50,
        0
JK 1090 DATA AD,28,C0,A9,4C,A0
        ,00,84,FB,91,14,A9,C0,
        85,FC,A2,04,B1,14,91
HQ 1100 DATA FB,88,D0,F9,E6,FC
        ,E6,15,CA,D0,F2,60,00,
        00,00,00,00,00,00,00
MR 1110 DATA 4C,3A,C0,4C,D0,C1
        ,4C,0A,C2,4C,2E,C2,4C,
        49,C2,4C,A5,C2,20,95
XG 1120 DATA C1,A5,14,8D,51,C1
        ,A5,15,8D,52,C1,20,A8,
        C0,20,BD,C0,20,72,C1
AQ 1130 DATA A9,00,8D,CE,C1,AD
        ,20,C0,F0,03,20,9F,C1,
        A9,00,85,A2,20,4B,C1
PH 1140 DATA C9,00,D0,07,20,A8
        ,C0,20,88,C1,60,8D,C9,
        C1,20,04,C1,20,88,C1
CE 1150 DATA AD,C9,C1,20,D2,FF
        ,20,72,C1,AD,C9,C1,29,
        7F,C9,21,30,03,20,D5
ME 1160 DATA C0,AD,8D,02,29,02
        ,F0,04,A9,05,85,A2,A9,
        03,C5,A2,10,FC,AD,8D
ME 1170 DATA 02,29,01,D0,F9,4C
        ,5D,C0,A0,19,A9,00,99,
        FF,D3,88,D0,FA,A9,0F
RQ 1180 DATA 8D,18,D4,A2,05,20
        ,42,C1,60,A9,00,8D,20,
        D0,8D,21,D0,A9,9F,20
QH 1190 DATA D2,FF,A9,93,20,D2
        ,FF,A9,8E,20,D2,FF,60,
        8D,C9,C1,A0,06,B9,C2
PA 1200 DATA C1,99,00,D4,88,10
        ,F7,A9,21,8D,04,D4,A2,
        00,A0,05,AD,8D,02,29
GH 1210 DATA 02,F0,02,A0,01,CA
        ,D0,FD,88,D0,FA,A9,FF,
        8D,04,D4,AD,C9,C1,60
GP 1220 DATA C9,85,D0,04,EE,20
        ,D0,60,C9,89,D0,0C,20,
        88,C1,A2,3C,20,42,C1
AF 1230 DATA 20,72,C1,60,C9,86
        ,D0,04,EE,21,D0,60,C9,
        8A,D0,04,20,BD,C0,60
FS 1240 DATA C9,87,D0,06,A9,8E
        ,20,D2,FF,60,C9,88,D0,
        05,A9,0E,20,D2,FF,60
HS 1250 DATA A2,01,A9,00,85,A2
        ,E4,A2,D0,FC,60,AD,CE,
        C1,D0,1B,AD,FF,FF,EE
HS 1260 DATA 51,C1,D0,03,EE,52
        ,C1,C9,01,D0,12,20,50,
        C1,8D,CE,C1,20,50,C1
SP 1270 DATA 8D,CF,C1,CE,CE,C1
        ,AD,CF,C1,60,A4,D3,B1,
        D1,8D,CC,C1,B1,F3,8D
GK 1280 DATA CD,C1,A9,A0,91,D1
        ,AD,86,02,91,F3,60,A4,
        D3,AD,CC,C1,91,D1,AD
CP 1290 DATA CD,C1,91,F3,60,20
        ,FD,AE,20,8A,AD,20,F7,
        B7,60,A0,00,A2,00,A1
DP 1300 DATA 14,59,20,C0,81,14
        ,A1,14,F0,0E,E6,14,D0,
        02,E6,15,C8,98,29,07
QM 1310 DATA A8,4C,A3,C1,A9,00
        ,8D,20,C0,60,00,32,00,
        01,FF,1F,FF,00,00,00
PA 1320 DATA 00,00,00,00,A9,DB
        ,8D,11,03,A9,C1,8D,12,
        03,60,A4,D3,B1,F3,48
QM 1330 DATA B1,D1,48,AD,86,02
        ,91,F3,A4,D3,68,48,49,
        80,91,D1,20,E4,FF,AA
CK 1340 DATA A4,D3,68,48,91,D1
        ,8A,F0,EB,A4,D3,68,68,
        91,F3,8A,A8,A9,00,4C
PA 1350 DATA 91,B3,20,95,C1,A2
        ,02,20,C6,FF,20,CF,FF,
        A0,00,91,14,20,B7,FF
MH 1360 DATA 29,40,D0,09,E6,14
        ,D0,EE,E6,15,4C,12,C2,
        A6,14,A4,15,60,20,95
QG 1370 DATA C1,A2,02,20,C9,FF
        ,A0,00,B1,14,F0,0C,20,
        D2,FF,E6,14,D0,F3,E6
MR 1380 DATA 15,4C,36,C2,60,20
        ,95,C1,A5,14,85,FB,A5,
        15,85,FC,A0,00,B1,FB
CA 1390 DATA D0,07,91,14,A6,14
        ,A4,15,60,C8,C0,FF,F0,
        04,D1,FB,F0,F7,C0,01
GB 1400 DATA F0,20,C0,02,F0,1C
        ,48,A9,01,20,9A,C2,98,
        20,9A,C2,18,65,FB,85
RH 1410 DATA FB,A9,00,65,FC,85
        ,FC,68,20,9A,C2,4C,54,
        C2,20,9A,C2,E6,FB,D0
MC 1420 DATA 02,E6,FC,4C,54,C2
        ,A2,00,81,14,E6,14,D0,
        02,E6,15,60,20,95,C1
GK 1430 DATA A2,02,20,C9,FF,A2
        ,00,A0,00,A1,14,59,20,
        C0,8E,CA,C1,8C,CB,C1
AK 1440 DATA 20,D2,FF,AE,CA,C1
        ,AC,CB,C1,A1,14,F0,0E,
        E6,14,D0,02,E6,15,C8
JK 1450 DATA 98,29,07,A8,4C,B1
        ,C2,60
XJ 2000 POKE53280,0:POKE53281,
        0:PRINT"{CLR}"CHR$(142
        )CHR$(8):X=2049
FP 2010 DEFFNA(X)=PEEK(X)+256*
        PEEK(X+1)
PX 2020 X=FNA(X):IFX<>0THENY=X
        +2:GOTO2020
GR 2030 IFPEEK(Y+1)=173THENSYS
        (Y+1)
HC 2040 IFPEEK(Y)=0THEN2080
DR 2050 PRINT"{4 DOWN}{GRN}THI
        S MESSAGE IS PROTECTED
        "
CE 2060 INPUT"{DOWN}PLEASE ENT
        ER PASSWORD ";K$
GQ 2070 FORZ=1TO8:N$=N$+K$:POK
        E49183+Z,ASC(MID$(N$,Z
        ,1)):NEXT:POKEY,0
QS 2080 PRINT"{CLR}{CYN}
        {9 SPACES}MESSENGER FI
        LE-PLAYER"
FH 2090 PRINT"{7}{9 DOWN}HOLD
        {SPACE}{RVS}{6} CMDR
        {OFF}{7} TO SPEED UP"
HD 2100 PRINT"{DOWN}HOLD {RVS}
        {6} SHFT {OFF}{7} TO F
        REEZE DISPLAY"
PS 2110 PRINTTAB(9)"{YEL}
        {9 DOWN}PRESS ANY KEY
        {SPACE}TO START":POKE1
        98,0
AJ 2120 GET A$:IF A$= "" THEN
        {SPACE}2120
FK 2130 SYS 49152,(Y+465):RUN
```

G

NEW! ACTION REPLAY v5.0

THE ULTIMATE UTILITY / BACKUP CARTRIDGE FOR THE C64/128

• Action Replay allows you to Freeze the action of any Memory Resident Program and make a complete back-up to disk - and that's not all ... Just compare these features.

SUPER CRUNCHER — ONLY $9.99

- A utility to turn your Action Replay 5 into a super powerful program compactor. Reduce programs by up to 50%! Further compact programs already cruched by AR5's compactor.

GRAPHICS SUPPORT DISK — ONLY $19.99

To take advantage of AR5's unique power, we have prepared a suite of graphic support facilities.

- SCREEN VIEWER: View screens in a 'slide show' sequence.
- MESSAGE MAKER: Add scrolling messages to your saved screens with music.
- PROSPRITE: A full sprite editor.
- ZOOM LENS: Explode sections of any saved screen to full size.

WARP 25

The world's fastest disk serial Turbo. A typical backup will reload in under 5 seconds.

- No special formats — with action replay you simply save directly into Warp 25 status.
- Backup all your existing programs to load at unbelievable speed!
- Warp Save/Load Available straight from Basic.

RAMLOADER

- You can also load load most of your commercial originals 25 times faster! With our special LSI logic processor and 8K of onboard Ram, Action Replay offers the world's fastest Disk Serial Turbo.

UNIQUE CODE CRACKER MONITOR

- Freeze any program and enter a full machine code monitor.
- Full Monitor Features.
- Because of Action Replay's on Board Ram the program can be looked at in its ENTIRETY. That means you see the code in its Frozen state not in a Reset state as with competitors products.

MORE UNIQUE FEATURES

- Simple Operation: Just press the button at any point and make a complete back-up of any* memory-resident program to tape or disk.
- Turbo Reload: All back-ups reload completely independent of the cartridge at Turbo speed.
- Sprite Monitor: View the Sprite set from the frozen program — save the Sprite — transfer the Sprite from one game to another. Wipe out Sprites. view the animation on screen. Create custom programs.
- Sprite Killer: Effective on most programs — make yourself invincible. Disable Sprite/Sprite/Background collisions.
- Unique Picture Save: Freeze and save any Hires Screen to tape or disk. Saved in Koala, Blazing paddles format.
- Compactor: Efficient compacting techniques — 3 programs per disk — 6 if you use both sides.
- Single File: All programs saved as a single file for maximum compatibility.
- Utility Commands: Many additional commands: Autonum, Append, Old, Delete, Linesaver, etc.
- Screen Dump: Print out any screen in 16 Gray Scales, Double size print options.
- Unstoppable Reset: Reset button to Retrieve System and Reset even so called Unstoppable Programs.
- Fully Compatible: Works with 1541/C/II, 1581, 1571 and with C64, 128, or 128D (in 64 Mode).
- Disk Utilities: Fast Format, Directory, List, Run and many other key commands are operated by Function Keys.
- Unique Restart: Remember all of these utilities are available at one time from an intergrated operating system. A running program can be Frozen to enter any Utility and the program is restarted at the touch of a key — without corruption.
- LSI Logic Processor: This is where Action Replay V gets its power. A special custom LSI chip designed to process the logic necessary for this unmatched Freeze/Restart power. No other cartridge has this power!

UPGRADE ROM — ONLY $16.99

- Give your AR IV all the power of the new V5.0.

Circle Reader Service Number 110

RIO DATEL COMPUTERS 800-782-9110

*ORDERS ONLY

MON-SAT 8AM-6PM (PACIFIC TIME)

CUST SERVICE
TECH SUPPORT
702-454-7700
TU-SA 10AM-6PM
FAX: 702-454-7700

DEEP SCAN BURST NIBBLER - $39.99 COMPLETE

THE MOST POWERFULL DISK NIBBLER AVAILABLE ANYWHERE AT ANY PRICE!

-Burst NIbbler is actually a two part system - a software package and a parallel cable to connect a 1541 or 1571 to a C-64 or C-128

-What gives Burst Nibbler its power? Conventional nibblers have to decode the data from the disk before it can transfer it using the serial port bus - when non-standard data are encountered they are beat. Burst Nibbler transfers data as raw GCR code via the parallel cable without the need to decode it, so you get a perfect copy of the original.

-Will nibble up to 41 tracks -Copy a whole disk in under 2 min -Installs in minutes - no soldering required on 1541 (1571 requires soldering)

SOFTWARE ALONE - ONLY $19.99 -- CABLE ALONE - ONLY $19.99

DIGITAL SOUND SAMPLER -Only $89.99

*Record any sound digitally into memory and then replay it with astounding effects * Playback forwards/backwards with echo/reverb/ring modulation *Full sound editing and realtime effects menu with waveforms *Powerful sequencer plus load & save function *Line In - Mic In - Line Out and feedback controls

MIDI 64 -Only $49.99

*Full specification MIDI at a realistic price *MIDI In - MIDI Out - MIDI Thru *Compatible with Digital Sound Sampler and Advanced Music system
MIDI CABLES (5 ft. professional quality) -Only $*8.99)

ADV. MUSIC SYSTEM -Only $29.99

*Powerful modular program for creating, editing, playing and printing out sheet music *Playback music through internal sound system or MIDI *Input music with the editor, piano keyboard emulator or a MIDI synthesizer *Contains 6 modules: Editor, MIDI, Keyboard, Synthesizer, Linker and Printer

MOTHER BOARD -ONLY $29.99

*Accepts 3 cartridges *Power on/off any slot *Onboard fuse *Reset button *Save wear & tear on your expansion port

TURBO ROM II -Only $24.99

*Replacement for the actual kernal inside your 64 *Loads/saves most programs at 5-6 times normal speed *Inproved DOS support including 10 sec. format *Programmed function keys: Load, Directory, Old etc. *Return to normal kernal at the flick of a switch *File copier *Special I/O loader *Lots more! *fitted in minutes *No soldering usually required

ROBOTARM -Only $89.99

*Full 5 axis movement with human like dexterity to manipulate small objects *Comes with C-64 interface & software, finger jaws, shovel scoop, magnetic attachment and 2 JOYSTICKS *Uses 4 D cells *Works with or without interface *22" total length

ADVANCED ART STUDIO -Only $29.99

*Windows, icons, pull down menus & pointing devices *Operates in HiRes mode *Full control over color attributes *16 pens, 8 random sprays, 16 user definable brushes *Windows can be cut, pasted, inverted, enlarged, reduced, squashed, stretched, flipped & rotated *3 levels of magnification *Lines, points, rectangles, triangles, circles, & rays with elastic facility *Solid & textured fill with 32 user definable patterns *All information on screen - no need to switch between picture & menu *Compatible with keyboard, joystick, mouse & Koala Pad

EPROMMER 64 - ONLY $69.99

*Top quality, easy to use EPROM programmer for the 64/128 *Menu driven software/hardware package makes programming, reading, verifying, copying EPROM'S simplicity itself *Program 2716 thru 27256 chips @ 12.5, 21 or 25 volts *Full feature system - all functions covered including device check/verify *The most comprehensive, friendly and best value for the money programmer available for the 64/128 *Ideal companion for Superom Expander, 16K EPROM board or any EPROM project
UV ERASER - ONLY $39.99 (Holds 4 EPROM'S)

SUPEROM EXPANDER -Only $49.99

*8 sockets each accept 8K thru 32K EPROM's *Onboard operating system - no programs to load *Menu driven - just press a key to load program *Select any slot under software control *Code generator feature will take your own programs and turn them into auto start programs (Eprom burner required)

TOOLKIT IV -Only $14.99

*The ultimate disk toolkit for the 1541 with more features than most for less *Absolute must for serious disk hacker *DISK DOCTOR V2 *HEADER/GAP EDITOR *DISK LOOK - recover lost files *Disassemble any program from disk to screen or printer *File compactor *Fast disk copy *Fast file copy *10 sec formatter *Error edit *Much, much more!

SMART CART CARTRIDGE -Only $59.99

NOW YOU CAN HAVE A 32K CARTRIDGE THAT YOU PROGRAM LIKE RAM THEN ACTS LIKE ROM!

*Battery backed to last up to 2 years *Make your own cartridges - even auto start types without the need for an EPROM burner *Can be switched in/out via software *Turn your cartridge into a 32K RAM DISK with our RAM DISK software - Only $14.99

ROBOTEK 64 -Only $64.99

MODEL & ROBOT CONTROL MADE EASY

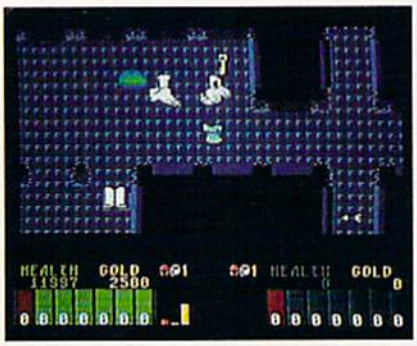
* 4 output channels - each with onboard relay *4 input channels - each fully buffered TTL level sensing *Analog input with full 8 bit A/D conversion *Voice input for voice control *Software features: test mode, analog measurement, voice activate & digital readout

RIO / DATEL
3430 E. TROPICANA AVE. #67
LAS VEGAS, NV 89121

*Add $4.00 shipping/handling in the continental U.S.: $7.00 - PR, AK, HI, FPO, APO: $10.00-Canada/Mex: C.O.D. orders add $3.00 to above charges: SPECIFIY COMPUTER MODEL WITH ORDER: VISA/MC/Checks/Money Orders/C.O.D. Accepted: Please call for return authorization number - returns subject to a 20% restocking fee: We reserve the right to substitute products of different appearance but equal quality and function for items pictured above: Prices subject to change without notice.

800-782-9110
702-454-7700
IN NEVADA

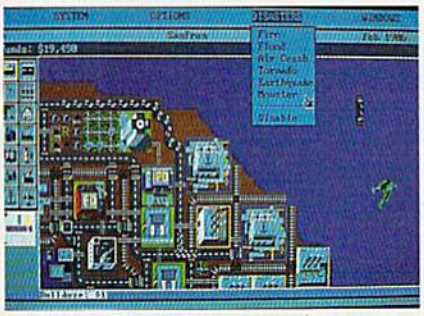
REVIEWS



Fire King Topnotch fantasy with grade-A graphics p. 63

Omni-Play Basketball
Great game for hoops lovers p. 63

Might and Magic II
New for fantasy combat fans p. 64



SimCity Innovative, award-winning simulation p. 64

BattleTech Successful departure for Infocom p. 65

WE'RE IN SAN DIEGO, FIRST STOP ON THE AVP TOUR. EXPECT LOTS OF ACTION TODAY.
CALVIN
HIS FEAR OF THE NET MAKES HIM AN EASY TARGET FOR THE SIX-PACK SLAM.
WILFRED
A CLASSIC BEACH BUM. WILFRED DOESN'T PRACTICE OFTEN, SO SLAM ON HIM HARD!

Kings of the Beach
Fun-filled 3-D volleyball simulation p. 66

Fire King

This new game comes from the Strategic Studies Group and Micro Forte, a software company "dedicated to creating the most visual and entertaining software" designed to keep you on the edge of your seat. *Fire King* comes within inches of this goal.

Fire King combines action and role play, and its pace never slows. Its fantasy-filled plot is extremely well conceived, and, unlike many games of this genre, it keeps the player's interest. *Fire King* is for one or two players, but playing with a friend makes the going much easier.

Your quest begins when the Fire King is killed and a supernatural Death Beast takes control of your town. It's up to you to assume the role of one of six characters to begin the first miniadventure and reclaim your town.

Each character is uniquely defined, and each one's attributes are different. Should you choose a magic user? A warrior? Your decision drastically affects gameplay, as certain attributes are more important than others.

Control and move your character in eight directions with a joystick. Bumping into an object adds that item to one of your nine pockets. When all pockets are filled, you're informed that you can carry no more.

> *Unlike many other action/role-playing games,* **Fire King** *holds your interest all the way through.*

Bumping into a book displays its contents or prompts you to answer a riddle. Be sure to note every clue along the way because a correct answer to the riddle rewards you with gold or another clue. Also, watch for scrolls. They contain magic spells you'll need throughout the game. Some spells permit you to walk on water, while others make you invisible.

You start off in your lodgings, the beginning and ending point of each quest. Leave your room and enter the town square. In the town, you may choose to steal gold from the Treasury, visit the Holy Temple of Dragara, or match your fighting or magic skills with monsters kept in the Thieves Guild. Exploring the town thoroughly is important: Many of the objects here can make your quest easier.

But the catacombs below the town is where the first adventure takes place. Here you must seek and destroy the Death Beast, releasing its evil hold on the town and permitting you to uncover the Fire King's mysterious tomb. Completing this miniquest is just one small part of the game.

After solving this first mystery, more difficult challenges test your mind and magic in the wilderness surrounding the world of the Fire King. The outskirts and landscapes are well detailed and designed, and they enhance the game's feeling of fantasy and adventure. The wilderness contains many species and races: Some are friendly, some are not. The terrain includes many rivers that erode your strength and dexterity. Boots for Water Walking are a must because the strong currents can carry your character away in no time.

Magic is an important part of *Fire King*. You'll need many enchanted objects to complete the game. Even though every character possesses magical abilities, spells are more powerful when cast by wizards and enchantresses.

Fire King comes on two disks and contains a decoder wheel that's needed to advance through each adventure. Also included on the inside cover of the package is a map of the mythical world, including a plan of the town. The landscape is painstakingly rendered. Every detail on the screen is shown on the map.

Fire King's only drawback is the player's manual. It isn't organized well, and it lacks information about the game's main objective. It contains hints for the first quest but doesn't provide a clue for subsequent ones.

Despite the manual's problems, *Fire King* does have flicker-free scrolling, grade-A graphics, and a captivating plot. It's a topnotch game all the way around.

—*Romney Laanstra*

Fire King
Strategic Studies Group
Distributed by Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$29.95

Omni-Play Basketball

I have an avid interest and involvement in sports. When I'm not shooting baskets at the playground on the corner, I usually can be found consulting the record books to settle a sports bet between my friends. But all that has changed now. Thanks to *Omni-Play Basketball*, I've gone pro.

I've become an owner. Next to basketball team owners, medieval potentates knew nothing of power, manipulation, or internecine warfare. We team owners must know when to trade and when to cut our players loose. For the fan, basketball consists of thrilling shots between the beer commercials; for the players, basketball is lived game to game. But for us owners, managers, and coaches in the upper echelons of Olympus, basketball isn't a matter of a single shot, game, or season. It's season after season, year after year. It's our life.

Omni-Play Basketball brings the entire snarling beast of basketball into your home, including the unsightly, seamy side of the business: back-room dealing. It's all here, cheerleaders, a side-view module (available at extra cost), and inane sports commentary for the brain-damaged—in short, professional sports in all its glory, but without the commercials.

But be warned, this isn't a game you can simply sit down with and start playing. It requires careful study. Get out your reading glasses; the manual is encyclopedic. Begin by looking over the history of the league and the teams, which provides a wealth of stats. Actual teams can be inspected as well, on a player-by-player basis. Then you can begin to build your team.

> *It's all here: cheerleaders, inane sports commentary, and pro basketball in all its glory, but without the commercials.*

Omni-Play Basketball provides you with a quantity of cash (trading points) which you use to purchase the best players you can afford from other teams. Recruit rookies or try to trade for better players (plus a healthy amount of cash). Another way to improve your team is to send a failing player to training camp. Players, as in real life, suffer injuries from which they must recover.

You can play against the computer or a friend, or (the ultimate in flexibility) *Omni-Play Basketball* can play itself until you get the hang of the game. Sit back and watch games played out in realistic animation or skip the actual game and go right to the score.

Ever since the invention of the videotape machine (a device developed to watch television for people who don't have time for it themselves, according to Douglas Adams), I've been looking forward to the self-playing videogame. You can set it up to play against itself and then go do something useful—like watching basketball on television.

As a coach, you can make decisions such as electing to charge in after free throws, work inside, work the clock, or go for the quick shot. You can elect to foul out the opposing team, anticipate inside passes, steal the ball, or change coverage. ▷

The major problem is that the game is slow in loading. The modules are high in quality, and it's obvious some very sophisticated work has gone into this package. A fast loader would have made a big difference. After a few minutes of loading, I have a tendency to wander away, watch the Lakers on the tube, and forget there's a game loading until my wife reminds me that I left the computer running.

The theory behind *Omni-Play* is that improvements and updates can be added periodically. This is a game designed to grow with you. Already, new modules—at about $20 each—have been introduced for side-view games and college play. *Fantasy League* is an update that allows you to assemble a dream team of greats throughout basketball history. What's next? Italian league? Who knows? But SportTime wants your suggestions. It looks like a creative team that's headed for the forefront in sports software.

—Robert Bixby

Omni-Play Basketball
SportTime
Dept #632
3187-G Airway Ave.
Costa Mesa, CA 92626
$34.95

Might and Magic II

It's rare when a film sequel surpasses or even lives up to the quality of the original, but computer games tend to get better as the Roman numerals following their names grow larger. Just consider the evolution of the Ultima and Wizardry series. *Might and Magic II* is no exception to this rule.

Might and Magic II builds upon the solid scheme of its predecessor, adding a number of enhancements to the program while leaving the basic system intact. The graphics have benefited from a complete facelift and rival the best of anything seen in other adventure games. Color and detail in the 3-D views of the landscape approach genuine artistry. The various creatures and characters encountered are rendered in equally vivid style and even display a small degree of animation. No matter how many hours you spend exploring the game's imaginary environs, your journey will never visually grow wearisome.

Some other changes, such as the inclusion of automapping and the addition of hirelings, help bring it in line with recent advances in adventure-game design. The game also introduces a few wrinkles of its own in the form of time travel and secondary skills that can be purchased by characters.

A big part of any sequel's appeal is that it lets you resurrect your seasoned warriors from the previous adventure and thrust them into a new set of deadly situations. This continuity is nice because veterans of the first *Might and Magic* will be able to plunge right into the thick of things without having to nurse new adventurers up to strength.

On the other hand, newcomers to the series will have to spend a fair amount of time tiptoing around the first town and dungeon before their characters are powerful enough to venture into the world at large. The rule book claims that encounters are tailored to the experience level of the party, but in practice beginners can expect to meet some nasty creatures in large quantities.

> *No matter how long you explore, your journey will never visually grow wearisome.*

Might and Magic II is set in the land of Cron, a once-peaceful empire now beset by the usual bevy of fantasy-game baddies—goblins, giants, dragons, and the like—plus a staggering assortment of uncommon creatures as well. (The back-of-the-box blurb promises more than 250 varieties of monsters.) The game's premise revolves around the evil-entity-threatens-world-with-destruction theme.

The introductory material in the manual remains deliberately vague, allowing you the pleasure of piecing together information yourself. In the absence of any initial context for your adventures, however, play appears rather aimless at the outset. While the various quests you undertake lend your wanderings some sense of direction, even these tasks often seem like plot devices to kill time (and monsters) until your characters acquire sufficient experience to begin their true mission.

But *Might and Magic II* is not coy when it comes to revealing something of the philosophy underlying its design. "Combat is the heart of *Might and Magic II*," the rule book reads. And in the course of play, you can expect to fight almost all of the 250 creatures that inhabit the realm. Even first-level characters may have to contend with 50 or more monsters in a single battle.

Fortunately, the combat system is fast-paced and smartly constructed. It dispenses with the maneuvering of individual characters and monsters in favor of a more abstract routine that still retains a tactical flavor. But it also lacks the ability to resolve combat automatically, a surprising omission considering the simplicity of the system. You will sorely miss this feature on those many occasions when you must fight your way through a horde of lesser creatures.

In a sense, the title sums up the focus of play because your progress hinges on repeated tests of your might and magic (or might alone, since magic primarily functions as a form of might in battle). However, *Might and Magic II* carries its preoccupation with combat to a dangerous extreme. The excessive swordplay risks turning the adventure into an exercise in battle tactics, with the land of Cron serving as nothing more than a cardboard stage for recurring mass melees.

In terms of design, *Might and Magic II* represents a significant improvement over its predecessor in every respect. Its primary problem is that its hack-'n'-slash mentality reveals a surprising lack of imagination for a fantasy game.

—Jeff Seiken

Might and Magic II
New World Computing
Distributed by Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$39.95

SimCity

Do you want to be a city father? Think you could do a better job of planning and running a city than the distinguished gentlemen down at City Hall? Well, Maxis Software and a city simulator called *SimCity* are ready to give you absolute control.

My fellow citizens, I would be less than candid if I did not tell you my first reaction to a city simulator was one of skepticism. Just how interesting could a computer program about city planning be? It sounds too much like work. But let me make this perfectly clear: *SimCity* is a blast!

Start with undeveloped terrain, clear a section of land, and then use your zoning authority to attract development. As Master Planner, it's your job to make sure each area has all the requirements to support the designated zoning. This means supplying electrical power, building roads, and offering public services. Only then will the Sims, microscopic people who populate the city, find it advantageous to move in and develop the properties.

As every city official knows, running a city costs money. Taxes must be collected from the Sims to expand the city and attract more growth. If you've done a good job in your planning and have included the right mix of residential, industrial, and commercial property, property values will skyrocket and Sims will flock to your city. When this happens, even more taxes may be collected due to the increased property

values and growing population. High-cost community projects, such as a major seaport or airport, can now be funded, putting you on your way to creating a booming metropolis.

Keeping up with the growth in your city isn't always easy. Traffic congestion can hamper expansion if road systems are inadequate. Residential areas can fill to capacity, effecting a labor shortage and a slowdown of industrial and commercial growth. A wise city manager is always one step ahead of demand.

SimCity's simulation activity marches on even when you're away from the keyboard. I left a rather complex city unattended for a half-hour, and when I returned I was aghast to find rampant unemployment, high levels of pollution, and traffic reminiscent of Los Angeles during rush hour. Luckily, I had saved the city in its earlier splendor to a data disk and could return to my utopia. An onscreen graph in the program helps you track problems of this type and stay ahead of uncontrolled growth.

> ***I often race my 9- and 11-year-old sons to the computer for first dibs on* SimCity.**

If you enjoy challenging tasks or wish to test your management skills against massive problems that can plague a city, *SimCity* offers eight ready-made, out-of-control city scenarios to tackle. Each scenario defies you to reverse the devastating effects that have the city on the brink of decay.

There's also a great disaster menu. Release a Godzilla-like monster and let it have its way with your city, and then try your best to restore power and repair the destruction in its wake. Fire storms can be selectively set or randomly generated as a byproduct of a destructive earthquake. Tornadoes can be made to wreak havoc at your command. Your best option after such disasters is to bulldoze a stricken area and rezone for future development.

Included with the program is a 43-page booklet, a hardware system card, and a user-reference card, all written exclusively for the 64 version. It's refreshing to see a software company that values Commodore users enough to write machine-specific documentation.

SimCity is a terrific simulation that offers hours, days, and months of enjoyment for the entire family. I often race my 9- and 11-year-old sons to the computer for first dibs on *SimCity*. It's a program that wears a variety of hats. I am reluctant to call it a game, but it operates and plays as easily as most games. It's a serious city simulation that can also provide casual entertainment. *SimCity* does not require a lot of study, but it manages to be highly educational—and a lot of fun.

—Steve Hedrick

SimCity
Maxis
Distributed by Brøderbund
17 Paul Dr.
San Rafael, CA 94903
$29.95

BattleTech

Infocom's *BattleTech: The Crescent Hawk's Inception* is a cross between a land-craft driving simulation, an *Empire Strikes Back*–style arcade challenge, and an *Ultima*-like role-playing game.

As Jason Youngblood, a thirty-first–century Lyran officer, your first chore is to learn the intricacies of piloting one of several BattleMech war machines. At the Pacifica Training School, you'll encounter simulated hostile craft that must be destroyed before you can advance to the next phase of your education. Completing this segment can be quite a chore, particularly in later stages when you are facing three enemy Mechs to your one.

Between practice missions, you'll spend your time visiting a variety of locations within the training area. You may chat with friends in the lounge, enroll in specialized combat classes at the citadel, buy and sell stocks at the ComStar station with the hope of making money to purchase items at the various shops, or go to your barracks to catch up on your sleep.

Before you get too comfortable, you are catapulted into the real world as the result of an enemy raid on your base. If you are skillful and lucky, you'll escape in the Chameleon, the sturdiest and deadliest Mech available. Although not as maneuverable as its lighter cousins and prone to overheating, the Chameleon is equipped with heavy armor and a multitude of weapons, including lasers, missiles, and machine guns. Additional conventional and high-tech armaments may be purchased in towns along your route, providing you have the funds. Parking and repair facilities are also at your disposal.

Traveling cross-country, you visit numerous locations (even video stores), enlist allies, discover hidden valuables, battle foes, and hopefully save the planet from the scourge of the loathsome Kurita warriors. At times, you'll engage enemy infantry. Without benefit of a Mech, these infantry groups can be dispatched quickly. Similarly, should your Mech be destroyed and you are ejected from it, you'll be a sitting duck until you can commandeer another vehicle.

Easing your chore somewhat is a user-friendly control system that consists of a series of menus, all accessible via a joystick or the keyboard. From the main menu, you may adjust a variety of game settings: You can set combat speed, inspect or heal your character, load or save a game, or view an overhead map. Later menus allow you to select types of movement and weapons, scan friendly and hostile units, decide whether to let the computer hold up your end of the battle or to do the fighting yourself, engage in combat, and choose among a host of other options.

The game screen consists of three areas. Depending on the situation, the upper left window features movement directions, battle reports, or animated sequences. Characters' attributes, represented by bar graphs, are presented in the lower left corner of the screen. During battle, this box contains combat commands. The right window, the largest of the three, displays attractive, 3-D overhead views of the figures and the scrolling countryside.

> **BattleTech *is a unique cross between a simulation, an arcade challenge, and a role-playing game.***

Occasionally, this scenery is replaced by text, recounting meetings and other events in Jason's life. As good as the descriptions of Jason's nightmare or the break-in at the mayor's house are, there is no way for the player to enter into the story.

The absence of this interaction makes *BattleTech* a far cry from Infocom's classic text adventures or even the company's newer graphics-oriented line of narrative/puzzle-solving entertainment.

The program comes without copy protection. However, to enter the training mode, all candidates must pass a test, which consists of correctly labeling the parts of a WSP-1A WASP reconnaissance Mech. A correctly labeled diagram appears only in the 20-page instruction booklet.

Six games may be saved on a back-up copy of the flip side of the program disk. Duplicating the original is a time-consuming process, as are the many disk loads required during play. Drawbacks aside, *BattleTech*'s designers have blended a number of genres and, by do-

Can Your Computer Make YOU $1,000,000?

WITH LOTTERY PC YOUR NEXT TICKET COULD BE WORTH MILLIONS!

LOTTERY uses the raw power and storage of your computer to determine and refine the number selection methods that will win the various lottery games you play. Don't be limited to the one or two methods that other programs use, they might not work in your state. There is no better system available!

Join the growing list of winners using our system.

SPECIFY
Lottery 64(C64/128) • Lottery +4(Plus/4)
Lottery ST (Atari) • Lottery PC
IBM PC/XT/AT and compatibles

Commodore64/128 & Plus/4 are registered trademarks of Commodore Int.

IBM PC/XT/AT are registered trademarks of International Business Machines Inc.

Atari ST is a registered trademark of Atari Corp.

To order, send $29.95 for each plus $3.00 postage & handling per order to:
(Illinois residents add 6% sales tax)
(Orders outside North America add $3.00)

MASTERCARD VISA

C.O.D. orders call:
(708) 566-4647

SMS Superior Micro Systems, Inc.
26151 N. Oak Ave., Mundelein, IL 60060

Circle Reader Service Number 125

Save Your Copies of GAZETTE

Protect your back issues of *COMPUTE!'s Gazette* in durable binders or library cases. Each binder or case is custom-made in pine green binding with embossed white lettering. Each holds a year of *Gazette*. Order several and keep your issues of *Gazette* neatly organized for quick reference. (These binders make great gifts, too!)

Cases:	Binders
$7.95 each:	$9.95 each:
3 for $21.95:	3 for $27.95:
6 for $39.95:	6 for $52.95:

CALL TOLL FREE
7 days, 24 hours, 1-800-972-5858

(Add $1 per case/binder for postage & handling. Please add $2.50 per unit for orders outside the U.S.)

Send in your prepaid order with the attached coupon.

Mail to: Jesse Jones Industries, Dept. GAZ
499 East Erie Ave., Philadelphia, PA 19134

Please send me _____ GAZETTE ☐ cases
☐ binders. Enclosed is my check or money order for $ _____. (U.S. funds only.)

Name _____

Address _____

City _____

State _____ Zip _____

Satisfaction guaranteed or money refunded.
Please allow 4-6 weeks for delivery. No P.O. Box Numbers Please

ing so, have created something unique. Players searching for new worlds to explore, futuristic vehicles to pilot, and battles to fight need look no further.

—Len Poggiali

BattleTech:
The Crescent Hawk's Inception
Infocom
Distributed by Mediagenic
3885 Bohannon Dr.
Menlo Park, CA 94025
$39.95

Kings of the Beach

Pull out the sunscreen and your neon jams—you're going to take the beach by storm. You have the speed, the agility, and the height to play stellar doubles volleyball in Electronic Arts' *Kings of the Beach*.

Boot up the game and head for the practice courts. *Kings of the Beach* has three courts where you can learn the basics and then hone your skills. Even if you've played in a gym, on a real beach, or in a park, you'll need some time with the coach in this game.

> *I've never played another sports simulation that so accurately recreates the feeling of the game.*

The hardest part of the game is finding the ball on the court. *Kings of the Beach* deserves a round of applause for creating a 3-D playing field onscreen, but that third dimension is the source of much confusion when the ball heads for your court. Just watch the ball's shadow instead of the ball, and soon you'll be moving to the right spot.

For those of us who head in the opposite direction, the game seems to nudge us to the right place. So don't be too aggressive as you control your player; he has an innate sense of where the ball is headed.

Setting is the easiest volleyball skill in *Kings of the Beach*. For one thing, your doubles partner nearly always bumps the ball right to you. For another thing, the timing is intuitive. After a few tries, you can easily figure out when to hit the joystick button for a beautiful set.

Bumping is a little harder. First, you must figure out where the ball will land. That's not as easy as it is in setting because your opponents are not as cooperative about getting the ball to you as your doubles partner is. Once you get to the right spot, you must hit the joystick button at just the right moment. Timing is much more critical in bumping than it is in setting.

Setting and bumping are the bread and butter of volleyball—not too spectacular, but essential to strategy. Spiking, on the other hand, is the crème-de-la-crème of beach volleyball. In *Kings of the Beach*, it's no different.

While bumping is a combination of placement and timing, spiking is all timing. Your setter is supposed to put the ball where you want it, so you're already in the right place. The trick is to double-click the joystick button at just the right instant to meet the ball properly. If you jump at the wrong time, you'll be flying while the ball rolls away. Sometimes a poorly executed spike results in a hit that goes out of bounds or a dink that drops gently into the opponent's court.

When you're on defense and the opponents spike into your court, the complementary move is a block, which is executed much like a spike. Double-click your joystick button just before your opponent connects with the ball. A good block sends the ball back to the other court faster than you can say *sand flea*.

After practicing each of these skills individually, you can play a few matches or enter the tournament. Each new pair of opponents is more skillful than the last, and each victory moves you closer to a new beach with new opponents. Tournaments are set in such exotic places as Rio, Hawaii, and Chicago.

Of all the sports simulations I've ever played, this is the best. To be fair, though, volleyball is my favorite sport in the real world. However, I've never played another sports simulation that so accurately recreates the feeling of the game. Even before I scored my first point against the easiest opponents, I loved *Kings of the Beach*.

Besides the simulation's accuracy, its graphics are excellent. Each player, although not sharply represented, is identifiable by a colorful pair of shorts, a sun visor, or some other characteristic. The screen is colorful, the 3-D field is a real challenge, and there is a two-player option.

Crowd noise and the sound of the sand flying under your feet create an atmosphere of sunny weather and competition. The game designers packed a lot of detail into this package.

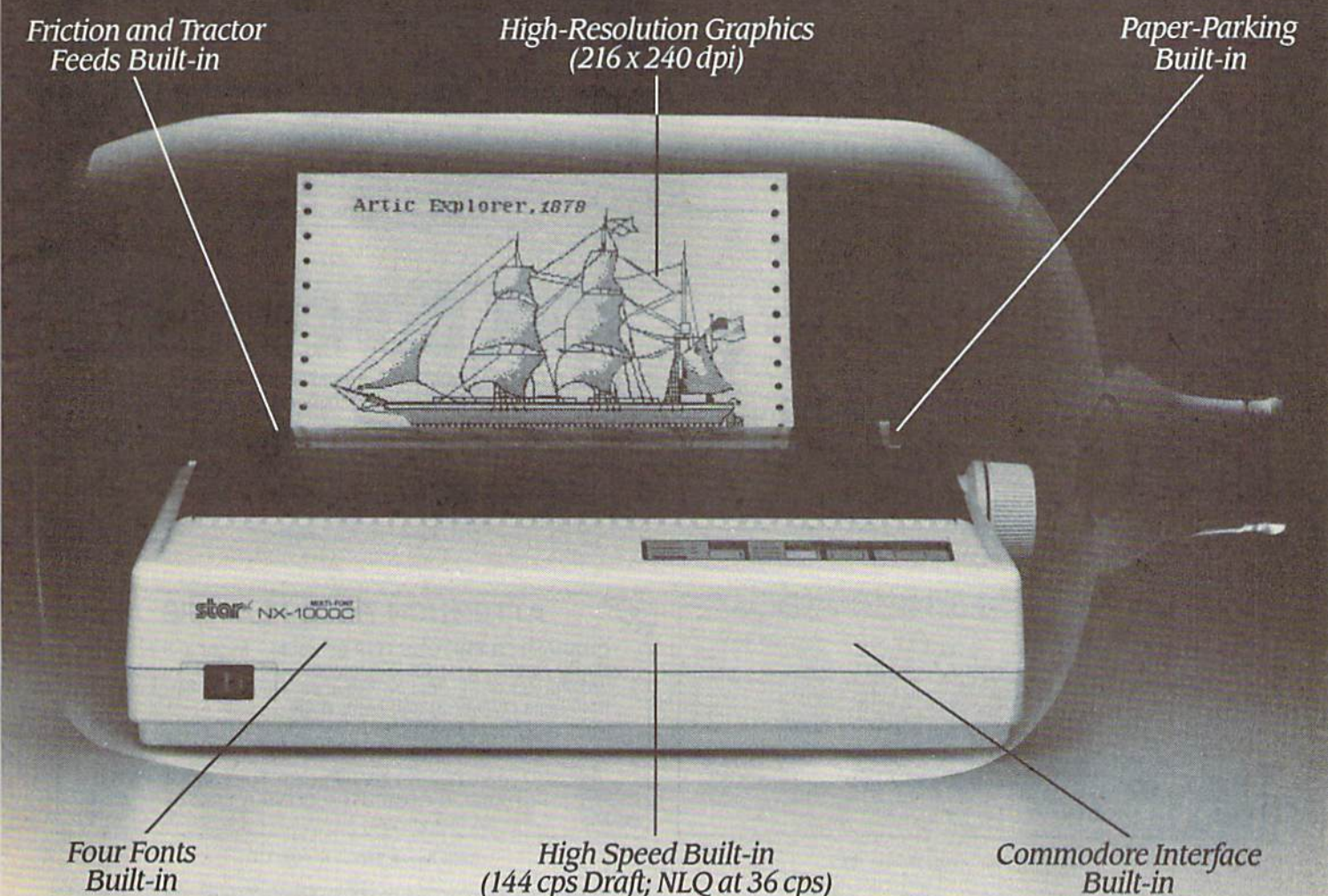
If you love volleyball, sports simulations, or well-designed games, you're a sure convert to *Kings of the Beach*. It combines all the best features into a fun and challenging game.

—Heidi E. H. Aycock

Kings of the Beach
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$29.95

G

The new Star Multi-Font. How did Star get it all in there?


Friction and Tractor Feeds Built-in
High-Resolution Graphics (216 x 240 dpi)
Paper-Parking Built-in
Artic Explorer, 1878
star NX-1000C
Four Fonts Built-in
High Speed Built-in (144 cps Draft; NLQ at 36 cps)
Commodore Interface Built-in

It wasn't easy. But, we built an incredible number of features into the Star NX-1000C Multi-Font™. So now you and your Commodore can be as creative as you like.

The best feature in this new Star printer is built into its name—Multi-Font. It has four built-in type fonts that give you twenty different print style options. Just mix these fonts in with its high-resolution graphics to make great looking reports, greeting cards, posters—whatever you want.

And the list of built-in features goes on—there's impressive speed in both draft and near letter quality. And an automatic single sheet feed. Plus, a paper-parking mechanism that lets you use single sheets without removing tractor paper. And the Multi-Font's easy-to-use push button control panel gives you command of over thirty-five functions.

Whether it's for serious work or serious play, the Star NX-1000C Multi-Font has so much built-in, you'll get more out of your Commodore. To find out where you can see the Multi-Font, call 1-800-447-4700.

star micronics

The ImagePower™ Printers

Multi-Font printout produced by Flexidraw 5.5 graphics software by Inkwell Systems.

Circle Reader Service Number 109

GAZETTE Shoppers Mart

√Book ™

Your spreadsheet or data base doesn't really understand your personal checking!
Check out these features:

- √17 types of checking transactions
- √ Handles overdraft protection
- √ Remembers payees for fast entry
- √ Full screen editing and selective queries
- √ 8 types of reports plus check printing
- √ C64/40 col. and C128/80 col. programs
- √ Supports 1541/1571/1581 drives
- √ Schedules periodic transactions
- √ Custom transaction categories
- √ Monthly balancing
- √ Optional password protection
- √ Utilities with partition tools for sub-directories on 1581 drives
- √ Calculator, and more . . .

Computer Craftware • 17966 Arboladа Way • Tustin, CA 92680
(714)953-8177 • $34.95 + $2.50 S&H (CA res. add 6%)

Circle Reader Service Number 107

BIBLE SEARCH

KJV or NIV—Complete New Testament text and Concordance with very fast word search and verse display capabilities. Word(s) in text can be found and displayed in seconds. Includes both C-64 and C-128 mode programs. Please specify 1541, 1571 or 1581 disk format. KJV—$25.00 (New) NIV—$30.00

BIG BLUE READER 128 64

Transfers word processing, text and ASCII files between Commodore and IBM MS-DOS diskettes. Requires 1571 or 1581 Disk Drive. ONLY $44.95

SOGWAP Software
(219) 724-3900
115 Bellmont Rd., Decatur, IN 46733

CAD

NOW! **ELECTRONIC TECHNICIANS, HOBBYISTS, AND ENGINEERS**

COMMODORE 64/128
RADIO SHACK COCO 2 + 3
YES! We accept

can design:
- OSCILLATORS
- POWER SUPPLIES
- AMPLIFIERS
- FILTERS

and
- LAYOUT CIRCUIT BOARDS

on your C-64 or C-128.

Outside CA 1-800-356-8113
In CA (714) 657-4449

ENTER your required input/output specifications and the computer designs the circuit. **ELEVEN** separate user-friendly, Computer Aided Design programs will help you build any custom device.

FREE detailed info.

Write:
WEASELGRAPHICS
Dept. 79
P.O. Box 2046, Sun City, CA 92381

Circle Reader Service Number 126

TAX COMMAND ©

EASY ENOUGH FOR INDIVIDUALS • POWERFUL ENOUGH FOR THE PRO

90% of users recently surveyed list ease of use as the most important reason to use it year after year. Includes Form 1040, Schedules A-SE, Forms 2106, 2119, 2441, 3903, 4562, 6251, and more. Prints on IRS forms. 1/2 price updates. GUARANTEED: RETURN FOR REFUND IF NOT SATISFIED. IBM: $99.95; Apple 2, Commodore 64, 128: $59.95. Send check or credit card info to Practical Programs, Inc., Box 93104, Milwaukee WI 53203. Or call

1-800-776-7047 MC VISA AM EX

Circle Reader Service Number 111

REPLACEMENT CHIPS, PARTS AND UPGRADES

AMIGA™

COMMODORE DIAGNOSTICIAN II
JUST RELEASED. This newly updated version saves you money on REPAIRS & DOWNTIME by promptly locating faulty IC chips on all COMMODORE computers & 1541 drives. Sections contain "cross referencing" of chips & "block layout" (schematic enclosed as extra). Over 12,000 "DIAGNOSTICIANS" sold worldwide. See fantastic full page review in Mar.'88 *Computer Shopper*. $6.95 prepaid in the U.S.

SEND FOR EXCLUSIVE CATALOG

Replacement Chips	
6510	$10.95
6526	$12.25
6567	$15.95
6581	$11.50
PLA	$12.95
All 901 ROMS	$10.95
AND MANY MORE	
C64 HvyDuty Pwr/S	$24.95

Amiga Chips/Upgrades	
8364/8362	$56.95
8520	$17.95
8372(NEW AGNUS)	$109.95
68881/16	$76.95
68881/20	$104.95
68882/16	$104.95
68020/33	$139.50
1.3 Kickstart ROM	$27.95

We sell printheads, ram expan., pwr. supplies, schematics, diagnostics, manuals, ribbons, plus.

THE GRAPEVINE GROUP, INC.
35 CHARLOTTE DRIVE • WESLEY HILLS, NY 10977
NY (914) 354-4448 1-800-292-7445 FAX (914) 354-6696

PRICES SUBJECT TO CHANGE — WE SHIP WORLDWIDE

Circle Reader Service Number 108

NEW ATTENTION ROLE PLAYERS NEW

CHARACTER EDITORS ($19.95 each) - Might and Magic, Bards Tale (1, 2, or 3), Wasteland, Ultima (2, 3, 4 or 5), Wizardry (1 or 2), Pool of Radiance, Neuromancer, Elite, Phantasie (1, 2 or 3) and Mars Saga.

HINT BOOKS ($9.95 each) - Wizardry 1, Wizardry 2, Might and Magic, and Legacy of the Ancients.

Add $3.00 for shipping/handling. Specify computer type on order.

GOSSELIN COMPUTER CONSULTANTS
P.O. Box 1083 • Brighton, MI 48116 • (313) 229-2453

Circle Reader Service Number 112

1-800-729-6026

The Eradicator Tm

Tejas Soft
206 W. Denison
Robinson, Texas 76706
817-662-4945 2pm-7pm CST M-F

Now Over 250 Parameters In Stock That Erase Projection Fast!

Call Or Write For Our Free Catalog
In-Stock Items Are Shipped Within 48 Hrs.

Serious Archiving Is Our Only Business, And Your Satisfaction Is Guaranteed!

- Eradicator Vol. 1 & 2 - Over 100 Parameters On Each Disk That Allow You To Archive Your Favorite Titles - $17.95 Ea.
- Eradicator Mini-Pak #1, #2, & #3 - Parameters For Over 20 Of The Latest Releases On Each Parameter Disk - $12.95 Ea.
- The 'Original' Parameter Cross-Reference - The Ultimate Archival Reference Periodical - $22.95 Or Quarterly Disk - $12.95

Add $3.00 p/h, $7.50 Foreign. TX Residents Add 7.5% Sales Tax. UPS Air & COD Extra

Shipping And Handling To APO & FPO Is Free - Dealers Welcome

Circle Reader Service Number 113

COMMODORE SOFTWARE CLOSEOUTS

Name Brand Software at Super Low Pricing. All software is NEW and in Original Packaging! These are *not* public domain titles. Famous brands like ACTIVISION, INFOCOM, SSI, SPINNAKER, EPYX, SYNAPSE, BRODERBUND, AVLON HILL & Many More!!! **FREE** Price List. Most Priced Under $10. Many formats like IBM/Apple also!

COMPSULT
P.O. Box 3233
San Luis Obispo, CA 93403-3233
805-544-6616

Circle Reader Service Number 105

ARTISOFT

DMBBS-THE BULLETIN BOARD OF THE 90'S! Supports Full Commodore® color graphics as well as ascii. Works at 300-2400 baud supporting the 1650, 1660, 1670, Avatex, Aprotek & ALL Hayes compatibles! Can be run with C64, 64C, SX64, C128 & C128D(64 mode), 1700 series RAM expanders, ALL 1541's & compatibles, 1571, 1581, SFD 1001 & various hard drives! 4 24 hour support lines plus info lines all around North America! Fastest BBS around today because the ENTIRE program is in memory! Capability of unlimited amounts of users, message bases, UD directories, libraries & on-line games! This BBS is menu driven & we know you will agree it is the most user-friendly BBS available for the Commodore® 64 today! Also available are full length on-line game modules that can be as large as the BBS and will enhance your system that much more! You are even provided a module construction kit so that you can make your OWN on-line games! 30 DAY MONEY BACK GAURANTEE! Send: Name, Alias, Address, Voice#, BBS#, BBS Name, Equipment Listing & Size disk. Reader Service #102 ARTISoft, P.O.Box 96, Glen Burnie, MD 21061

DMBBS v4.7	$40
Delux Mods 89	$40
Empire Deluxe	$15
Casino	$10
Freddy	$10
B.T.L.C.	$10
Underworld	$15
Murder Motel	$15
Car Wars	$15
(301)553-0201	
(301)553-0001	
Add $3 S&H in U.S.	
Add $5 S&H in CAN	
C.O.D.'s add $5	
Md. Residents add 5%	

NOTHING LOADS YOUR PROGRAMS FASTER THAN THE QUICK BROWN BOX
A NEW CONCEPT IN COMMODORE© CARTRIDGES

Store up to 30 of your favorite programs in a single battery-backed cartridge for easy, instant access. Change contents as often as you wish. The Quick Brown Box accepts most unprotected and "frozen" programs including the only word processor that saves your text as you type, "The Write Stuff." Coexists with GEOS© and Commodore RAM Expansion Units. Loader utilities included for both C-64 and C-128 modes.

16K $69; 32K $99; 64K $129 (plus $3 s/h; MA res. add 5%). Call for "Write Stuff" pkg.
Brown Boxes, Inc., 26 Concord Rd., Bedford, MA 01730: (617) 275-0090; 862-3675.

"Good Reliable Stuff" *Info (Jan/Feb '88)*
"A Little Gem" *Twin Cities 128 (Mar/Apr '88)*
"You'll Never Lose Your Cool, or Your Programs" *RUN (Nov '87)*
"A Worthy Product—Long Overdue" *Ahoy (Feb '88)*

Shoppers Mart

CAD-3D
3-D GRAPHICS DESIGN
☆ Voted Best Graphics Program —*Run Magazine 1988*
For Commodore 64/128 in 64 mode
View Designs in Multiple Perspectives

Professional-Educational-Home Applications
Architects, Engineers, Designers, Programmers, Students

CAD-3D!! enter me into the fastest growing field in graphic technology. At a special introductory price $53.95. Add $4.00 for shipping and handling, for C.O.D. add an additional $4.00. (California residents please include 6% sales tax).

iht Software
2269 CHESTNUT STREET
SUITE 162
SAN FRANCISCO, CA 94123
ORDER LINE • (415) 923-1081
FAX • (415) 923-1084
Dealers/Distributors inquiries welcomed.

Circle Reader Service Number 186

LEARN TO PLAY GUITAR
GUITAR TUTOR

Have you or a member of your family ever wanted to learn to play guitar? Let your computer teach you using this unique new program that allows you to learn at home at your own pace. Much less expensive than formal lessons, "GUITAR TUTOR" will have you playing in no time. Its time-tested methods made learning easy and fun. So impress your family and friends by becoming one of the many people that know the joy and satisfaction of playing the guitar well. Specify C-64 or C-128 and sent $29.95 to:

Northern Star Software, P. O. Box 63, Oak Creek, WI 53154
For MasterCard/Visa orders, call toll-free: 1-800-648-5286

Circle Reader Service Number 185

LOTTERY PLAYERS: Introducing Proline a program based on Gale Howards winning strategies for your C64 or 128. Includes wheeling systems, hotnumbers, trend chart for $34.95 Orders and Info to Acorn Software 2721 Ohio St Mich. City In 46360 PH219-879-2284

Circle Reader Service Number 184

Paradise Software

COMMODORE® 64/128
5 Disk Special $14.95
Choose any 5 disks listed (Postage Paid / USA Only)

SPORTING LIFE (6104) Sport games.
DO IT YOURSELF BUSINESS PAPERS (6002)*-Customize & print business forms, invoices, labels, etc.
PUB/BOARD GAMES (6118)-Darts, monopoly and more.
FUN GRAPHICS MACHINE (6001)*-Desktop publishing
IN THE PITS (6100) - Driving games.
IN THE MALL / 2 (6099) - Arcade action.
LADY LUCK (6101) - Vegas style games.
PRODUCTIVITY AIDES (6105) - Nice collection.
STEREO SID PLAYER V10 (6005) -animated music files which can play in stereo.
MENU MAKERS (6003) - collection of menu making programs with 3D menu maker, etc.

*Shareware requires separate payment to authors if found useful. Each disk is $2.99 when less than 5 are ordered plus $4.00 shipping/handling- Nevada residents add 6% sales tax.
4600 Paradise Rd. #26 • Las Vegas, NV 89101
(702) 731 - 6566 Expires 4-30-90

Circle Reader Service Number 183

COMPUTE!'s
SpeedScript Disk

ONLY $9.95!

A powerful word processing package for Commodore and Apple II owners

A Great Deal for Commodore Users!

- *SpeedScript* for the 64
- *SpeedScript 128*—80-column version
- Spelling checkers
- Plus more than a dozen other *SpeedScript* support utilities all on one disk (including full documentation)

Two Versions for Apple Users!

- *SpeedScript* 3.0—40-column word processor
- *SpeedScript 80*—80-column version
- Conversion programs to move files from ProDOS to DOS 3.3 and back
- Full documentation on disk

YES! Send me _____ copies of COMPUTE!'s *SpeedScript* Disk.

I've enclosed $9.95 plus $2.00 postage and handling. (Outside U.S. and Canada add $1.00 for surface mail or $3.00 for air mail.)

_____ Amount
_____ Sales Tax*
_____ Total

ORDER NOW!

Name _____

Address _____

City _____ State _____ ZIP _____

Check here for: ☐ Apple version
☐ Commodore version

Mail personal check or money order to

Commodore *SpeedScript* Disk
P.O. Box 5188
Greensboro, NC 27403

or

Apple *SpeedScript* Disk
P.O. Box 5188
Greensboro, NC 27403

*Residents of New York, Pennsylvania, and North Carolina must add appropriate sales tax. All orders must be paid in U.S. funds by a check drawn on a U.S. bank. Sorry, no credit card orders accepted.

Please allow 4–6 weeks for delivery. Program available only on 5¼-inch disks.

machine language programming

A Word Counter

Jim Butterfield

Last month, we began a discussion of *256-tables*. These are tables of 256 bytes, arranged so that a program can reference any position in the table by way of the X or Y index registers.

This month, we'll use a *fixed* table—a table whose values have been preset by BASIC to help us perform a word count on a text document. Each item in the table will represent a particular ASCII character. If a character is used within a word, the corresponding table entry will be 1; otherwise, the table entry will be 0. Certain characters are vague, and we must make arbitrary decisions about them. For example, the hyphen: Is *half-hour* one word or two?

Here's the idea: We grab a character from the text file. By referring to the 256-table, we get a classification: 1 or 0, word character or not. If we find that a new character is classified as 1, and the previous character was classified as 0, we know that a new word is starting. In such a case, we increment the word counter.

Keep in mind that many word processors do not store text files as conventional PET-ASCII characters. They might use screen codes or true ASCII characters. If so, you must change the 256-table to correspond to this character type.

A Word-Counting Program

Word Count works on both the 64 and the 128. The BASIC portion of the program POKEs the machine language routine into memory at $2500 (9472) and then builds the 256-table that identifies the characters at $2600 (9728). It sets all values in the table to 0 and then reclassifies the alphabetic characters—both upper- and lowercase—and numeric characters as 1.

Next, it opens the file to be checked as logical file 1 and then activates the machine language routine with a SYS call. We begin by zeroing certain counters.

```
2500 LDA #$00    ;set . . .
2502 STA $25F0   ;. . . low-order word
                  count,
2505 STA $25F1   ;high-order word
                  count,
2508 STA $25FF   ;and word flag to 0
```

Then we connect our input to logical file 1, previously opened by BASIC.

```
250B LDX #$01    ;logical file 1
250D JSR $FFC6   ;switch input stream
```

The next instruction begins our main loop. Each time around the loop, we take a character from the file.

```
2510 JSR $FFE4   ;get character from file
```

We transfer the character to the Y register, and then we use it to get the character type, 1 or 0.

```
2513 TAY         ;move character to Y
2514 LDA $2600,Y ;and get character
                  type
```

The previous character type has been stored at address $25FF. If the new character is the same type, we skip ahead, as there's no work to be done.

```
2517 CMP $25FF   ;same type as before?
251A BEQ $252A   ;yes, so continue
```

Otherwise, we know the character type has changed—from 1 to 0 at the end of a word, or from 0 to 1 at the beginning of a word. In either case, we log the new previous-character status.

```
251C STA $25FF   ;log changed type
```

Then we test the new character type for 0. The easiest way to do this is to transfer it to another register, say Y. If the character type is 0, we're at the end of a word and can skip any extra accounting.

```
251F TAY         ;test character type
2520 BEQ $252A   ;if 0, continue
```

If it isn't 0, we've found the start of a word. So, we increment our word counter.

```
2522 INC $25F0   ;add to counter
2525 BNE $252A   ;if overflow . . .
2527 INC $25F1   ;add to high byte.
```

Everything joins together here. We test the status (ST) byte to see if there are any more bytes to be read from the file.

```
252A LDA $90     ;test ST byte
252C BEQ $2510   ;if more, go back
252E JMP $FFCC   ;CLRCHN and quit
```

The BASIC program takes over at this point and prints the number of words.

Remember: If you find yourself doing a lot of comparisons—especially with characters or bytes—take a look to see if a 256-table can do the job. In the extreme case, a double table could let you dig out a 16-bit address for each type, and branch to that address. It's a powerful technique.

Word Count

```
AR 100 DATA 169,0,141,240,37,1
       41,241,37
MH 110 DATA 141,255,37,162,1,3
       2,198,255
HE 120 DATA 32,228,255,168,185
       ,0,38
DE 130 DATA 205,255,37,240,14,
       141,255
HQ 140 DATA 37,168,240,8,238,2
       40,37,208,3
RH 150 DATA 238,241,37,165,144
       ,240,226
QE 160 DATA 76,204,255
RD 200 FOR J=9472 TO 9520
EJ 210 READ X:T=T+X
BP 220 POKE J,X
AE 230 NEXT J
PF 240 IF T<>7145 THEN STOP
CK 500 C=9728:C0=C+128
GF 510 FOR J=0 TO 255:POKE J+C
       ,0:NEXT J
EH 520 FOR J=48 TO 57:POKE J+C
       ,1:NEXT J
PK 530 FOR J=65 TO 90
BB 540 POKE J+C,1:POKE J+C0,1
SK 550 NEXT J
PB 600 OPEN 15,8,15
FE 610 INPUT "FILE NAME";F$
FR 620 OPEN 1,8,2,F$
BX 630 INPUT#15,A,A$,A1,A2:IF
       {SPACE}A<>0 THEN PRINT
       {SPACE}A$:STOP
EP 640 SYS 9472
QE 650 CLOSE 1
AH 660 CLOSE 15
GH 670 W=PEEK(9712)+PEEK(9713)
       *256
JK 680 PRINT "FILE HAS";W;"WOR
       DS."                    G
```

Use the handy *Reader Service Card* in the back of the magazine to receive additional information on our advertisers.

ADVERTISERS INDEX

Reader Service Number / Advertiser	Page
184 Acorn Software	69
118 Activision	4
117 American Micro Supplies	22
127 APROTEK	56
102 Artisoft	68
123 Briwall	44-45
Brøderbund	IFC
Brown Boxes, Inc.	68
183 California Freeware	69
105 COMPSULT	68
107 Computer Craftware	68
199 Computer Direct, Inc.	73
196 Creative Micro Designs, Inc.	11
187 Damark	77
128 Financial Services Marketing Corporation	53
106 GAMESTAR/Activision	2
197 Gemini Marketing, Inc.	22
112 Gosselin Computer Consultants	68
108 The Grapevine Group	68
186 iht Software	69
130 Konami	BC
129 Lyco Computer	57
200 Medalist International/Micro Prose	IBC
190 Micro Illusions	3
191 Micro Illusions	3
189 Micro Illusions	5
Montgomery Grant	33
185 Northern Star	69
NRI Schools	29
198 ORIGIN	25
192 P.A.V.Y. Software	43
111 Practical Programs, Inc.	68
195 Precision Images	43
193 Ramco Computer Supplies	43
110 RIO Datel Computers	61
119 The Soft Group	16
124 Software Discounters of America	12-13
SOGWAP Software	68
109 Star Micronics	67
125 Superior Micro Systems, Inc.	66
113 Tejas Soft	68
Tektonics Plus, Inc.	11
188 Triton/Mediagenic	27
139 Utilities Unlimited	17
126 Weaselgraphics	68

Classified Ads	78
Gazette Disk Library	6
The GEOS Collection Disk	76
Mean 18 Disk	69

MAIL TO:

COMPUTE!'s GAZETTE SUBSCRIBER SERVICE

P.O. Box 3251, Harlan, IA 51537

Change of Address: Please advise as early as possible. Attach label with your old address and write in new address below.

New Subscriber: Fill in your name and address below. Use separate sheet for gift orders.

PLACE LABEL HERE

Renewal: Attach label.

____ One year $24.00 ____ Two years $45.00
(Foreign subscribers please add $6.00 per year for postage)

NAME _____

STREET _____

CITY/STATE/ZIP _____

____ Please bill me ____ Payment enclosed

For other subscription questions or problems, please write a note and send entire form to the above address. OR CALL TOLL-FREE:

1-(800) 727-6937

The Automatic Proofreader

Philip I. Nelson

The Automatic Proofreader helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader exactly* as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press RETURN. After the program displays the message "Proofreader Active," you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the *Proofreader* displays a two-letter checksum in the upper left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If not, check for your mistake and correct the line.

The *Proofreader* ignores spaces not enclosed in quotation marks, so you can omit or add spaces between keywords and still see a matching checksum. However, spaces inside quotes are almost always significant, so the program pays attention to them.

The *Proofreader* does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it, moving the cursor back to the line, and pressing RETURN.

If you're using the *Proofreader* on the 128, *do not perform any GRAPHIC commands while the* Proofreader *is active*. When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the *Proofreader*—to another memory area, causing the *Proofreader* to crash. The same thing happens if you run any program with a GRAPHIC command while the *Proofreader* is in memory.

Though the *Proofreader* doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (65341 for the 128, 64738 for the 64). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

When using the *Proofreader* with another utility, disable *both* programs before running a BASIC program. While the *Proofreader* seems unaffected by most utilities, there's no way to promise it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The Automatic Proofreader

```
10 VE=PEEK(772)+256*PEEK(773):LO
   =43:HI=44:PRINT "{CLR}{WHT}AU
   TOMATIC PROOFREADER FOR ";
20 IF VE=42364 THEN PRINT"C-64"
30 IF VE=17165 THEN LO=45:HI=46:
   WAIT CLR:PRINT "128"
40 SA=(PEEK(LO)+256*PEEK(HI))+6:
   FOR J=SA TO SA+166:READ B:POK
   E J,B:CH=CH+B:NEXT
50 IF CH<>20570 THEN PRINT "*ERR
   OR* CHECK TYPING IN DATA STAT
   EMENTS":END
60 FOR J=1 TO 5:READ RF,LF,HF:RS
   =SA+RF:HB=INT(RS/256):LB=RS-(
   256*HB)
70 CH=CH+RF+LF+HF:POKE SA+LF,LB:
   POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT "*ERR
   OR* RELOAD PROGRAM AND CHECK
   {SPACE}FINAL LINE":END
90 IF VE=17165 THEN POKE SA+14,2
   2:POKE SA+18,23:POKESA+29,224
   :POKESA+139,224
100 POKE SA+149,PEEK(772):POKE S
   A+150,PEEK(773):PRINT "{CLR}P
   ROOFREADER ACTIVE"
110 SYS SA:POKE HI,PEEK(HI)+1:PO
   KE (PEEK(LO)+256*PEEK(HI))-1,
   0:NEW
120 DATA120,169,73,141,4,3,169,3
   ,141,5,3,88,96,165,20,133,167
130 DATA165,21,133,168,169,0,141
   ,0,255,162,31,181,199,157,227
140 DATA3,202,16,248,169,19,32,2
   10,255,169,18,32,210,255,160
150 DATA0,132,180,132,176,136,23
   0,180,200,185,0,2,240,46,201
160 DATA34,208,8,72,165,176,73,2
   55,133,176,104,72,201,32,208
170 DATA7,165,176,208,3,104,208,
   226,104,166,180,24,165,167
180 DATA121,0,2,133,167,165,168,
   105,0,133,168,202,208,239,240
190 DATA202,165,167,69,168,72,41
   ,15,168,185,211,3,32,210,255
200 DATA104,74,74,74,74,168,185,
   211,3,32,210,255,162,31,189
210 DATA227,3,149,199,202,16,248
   ,169,146,32,210,255,76,86,137
220 DATA65,66,67,68,69,70,71,72,
   74,75,77,80,81,82,83,88
230 DATA13,2,7,167,31,32,151,116
   ,117,151,128,129,167,136,137
```

G

How to Type In *COMPUTE!'s Gazette* Programs

Each month, *COMPUTE!'s Gazette* publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is the *quote mode*.

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. In this case, you can use the DEL key to back up and edit the line. Type another quotation mark and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
[4]	COMMODORE 4	
[5]	COMMODORE 5	
[6]	COMMODORE 6	
[7]	COMMODORE 7	
[8]	COMMODORE 8	

SAVE 30-70%

CALL FOR YOUR FREE CATALOG TODAY!

1-800-BUY-WISE EXT. 11

1200 BAUD EXTERNAL MODEM

Features Include:
- RS232/DB25 Connector
- DB9 Pin Adapter
- Telephone Cable
- 1200/300 bps Asynchronous
- Full or Half Duplex
- Auto Dial/Auto Answer
- Standard 9 Volt Battery

AC Adapter Sold Separately for $4.95

OUR LOW PRICE
$69.95
List $199.95

ACCESSORIES

C64C Computer with One FREE Action Game	$129.95
1541-II Disk Drive with One FREE Action Game	$179.95
Epyx 200XJ Joystick	$10.95
Wico Ergostick	$17.95
M-3 Analog Mouse	$43.95
Hearsay 1000	$65.95
Dust Covers	$10.95
5.25" Disk Cleaner	$7.95

NO ONE CAN SELL THIS PRINTER FOR LESS!

180 CPS PRINTER WITH NLQ

LIFETIME WARRANTY ON PRINTHEAD

- 2 Year Immediate Replacement
- Dot Addressable Graphics
- Italics, Elite, Pica, Condensed
- Centronics Parallel Port
- 8K Printer Buffer
- NLQ Selectable from Front Panel
- Low Cost Adapters Available
- Pressure Sensitive Controls
- Includes One FREE Ribbon

OUR LOW PRICE
$149.95
List $299.00

SOFTWARE

Shinobi *List $34.95*
by Sega.....**$23.95**

After Burner *List $34.95*
by Mindscape.....**$23.95**

John Madden Football *List $43.95*
by Electronic Arts.....**$30.95**

Wordwriter 4 *List $39.95*
by Timeworks.....**$27.95**

Omni-Play Basketball *List $34.95*
by Broderbund.....**$24.95**

MTV® Remote Control *List $12.95*
by Hi Tech Expressions.....**$8.95**

Monopoly *List $39.95*
by Electronic Arts.....**$23.95**

SAVE $200 ON THE NEW COMMODORE 64C TEST PILOT PACKAGE

Package Includes:
- C64C Computer
- 1541-II Disk Drive
- ACE Joystick *by Kraft*
- Five Software Packages:
  - Advanced Tactical Fighter
  - Infiltrator II
  - Harrier
  - Crazy Cars
  - Tomahawk

ALL THIS FOR ONLY
$299.95
List $499.95

SHAREDATA SOFTWARE

Jeopardy *List $12.95*....Now **$6.95**

Jeopardy 2 *List $12.95*.....**$6.95**

Sports Jeopardy
List $17.95.....Now **$6.95**

Junior Jeopardy
List $14.95.....Now **$7.95**

Wheel of Fortune
List $12.95.....Now **$6.95**

Wheel of Fortune 2
List $14.95.....Now **$7.95**

Wheel of Fortune 3
List $14.95.....Now **$7.95**

MAGNAVOX 13" COLOR COMPOSITE

Model No. CM8702

ONE YEAR LIMITED WARRANTY

OUR LOW PRICE
$199.95
List $299.95

5.25" DOUBLE SIDED/ DOUBLE DENSITY DISKS

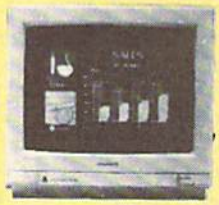
AS LOW AS
19¢ ea

MADE IN THE U.S.A.

100% Certified • Lifetime Guarantee

5.25" DSHD DISKS	3.5" DSDD DISKS
AS LOW AS	LOTS OF 10
45¢ ea	**59¢ ea**

MAGNAVOX 13" COLOR RGB



Model No. CM8762

ONE YEAR LIMITED WARRANTY

OUR LOW PRICE
$234.95
List $399.95

Prices do not include shipping charges. Call to get your lowest delivered cost. We insure all shipments at no extra cost to you! All packages are normally shipped UPS Ground. 2nd day and overnight delivery are available at extra cost. We ship to all points in the US, Canada, Puerto Rico, Alaska, Hawaii, Virgin Islands and APO-FPO. Monitors only shipped in Continental US. Illinois residents add 6.5% sales tax. Prices and availability subject to change without notice. Not responsible for typographical errors or omissions. *Computer Direct will match any current (within 30 days) nationally advertised price on exact same items. Shipping and sales tax not included. Verification required.

FAX Ordering 708-382-7545 Outside Service Area, Please Call 708-382-5058

COMPUTER DIRECT, INC.
22292 N. Pepper Road
Barrington, IL 60010

"We Love Our Customers"

MLX Machine Language Entry Program for Commodore 64

Ottis R. Cowper

MLX is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of *MLX*—you'll want to use it to enter future ML programs from *COMPUTE!'s Gazette*. When you're ready to enter an ML program, load and run *MLX*. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the *MLX*-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in *MLX*) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters *A–F*. But even if you know nothing about ML or hex, you should have no trouble using *MLX*.

After you've entered the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is Enter Data. If you're just starting to type in a program, pick this. Press the E key and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you stopped typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering a Listing

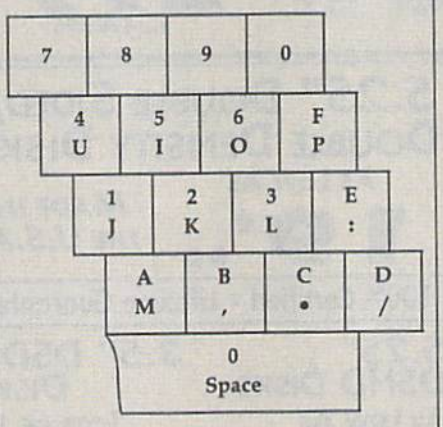
Once you're in Enter mode, *MLX* prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an *MLX*-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows *MLX* to check your typing.

When you enter a line, *MLX* recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if *MLX* detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; *MLX* automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; *MLX* automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters *A–F* can be entered. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, a numeric keypad function is included. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration.



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, *MLX* will catch your mistake. There is one error that can slip past *MLX*: Because of the checksum formula used, *MLX* won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, *MLX* disables RETURN until the cursor returns to the start of a line. Remember, press CLR/HOME to quickly get to a line-number prompt.

To make corrections in a line that *MLX* has redisplayed for editing, compare the line on the screen with the one printed in the listing and then move the cursor to the mistake and type the correct key. The cursor-left and -right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells *MLX* to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch or if you want to get to a line-number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, Display Data, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, *MLX* asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. *MLX* displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (*MLX* finishes printing the current line before halting.) Press the space bar again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are Save File and Load File. When you press S or L, *MLX* asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. This is normal behavior. *MLX* opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Also note that the drive prefix 0: is added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for save-with-replace, so be sure to give each version saved a different name.

Remember that *MLX* saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When you're saving a partially completed listing, make sure to note the address where you stopped typing.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. It also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran *MLX*; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started *MLX*; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started *MLX*. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun *MLX*, being careful to enter the correct starting and ending addresses.

The Quit menu option has the obvious effect—it stops *MLX* and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or press any other key to return to the menu. After quitting, you can type RUN again and reenter *MLX* without losing your data, as long as you don't use the Clear Workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready for the results. Refer to the corresponding article for details on loading and running the program.

An Ounce of Prevention

By the time you've finished typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use *The Automatic Proofreader* to type the new *MLX*, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses; then use the display option to verify that the data has been entered correctly. And be sure to test the save and load options several times to ensure that you can recall your work from disk or tape.

64 MLX

```
EK 100 POKE 56,50:CLR:DIM IN$,I,
       J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z4=
       254:Z5=255:Z6=256:Z7=127
CJ 120 FA=PEEK(45)+Z6*PEEK(46):B
       S=PEEK(55)+Z6*PEEK(56):H$
       ="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}":S
       $=" ":D$=CHR$(20):Z$=CHR$
       (0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD+2
       3:POKE I,0:NEXT:POKE SD+2
       4,15:POKE 788,52
FC 150 PRINT"{CLR}"CHR$(142)CHR$
       (8):POKE 53280,15:POKE 53
       281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}{2 SPACES}
       "SPC(28)"{2 SPACES}{OFF}
       {BLU} MLX II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}{3 SPACES}C
       OMPUTE!'S MACHINE LANGUAG
       E EDITOR{3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADDRE
       SS{4}";:GOSUB300:SA=AD:GO
       SUB1040:IF F THEN180
GF 190 PRINT"{BLK}{2 SPACES}ENDI
       NG ADDRESS{4}";:GOSUB300:
       EA=AD:GOSUB1030:IF F THEN
       190
KR 200 INPUT"{3 DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]{4}
       ";A$:IF LEFT$(A$,1)<>"Y"T
       HEN220
PG 210 PRINT"{2 DOWN}{BLU}WORKIN
       G...";:FORI=BS TO BS+EA-S
       A+7:POKE I,0:NEXT:PRINT"D
       ONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND ME
       NU {DOWN}{4}":PRINT T$"
       {RVS}E{OFF}NTER DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISPLA
       Y DATA":PRINT T$"{RVS}L
       {OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE F
       ILE":PRINT T$"{RVS}Q{OFF}
       UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=MI
       D$("EDLSQ",I,1)THEN A=I:I
       =5
FD 270 NEXT:ON A GOTO420,610,690
       ,700,280:GOSUB1060:GOTO25
       0
EJ 280 PRINT"{RVS} QUIT ":INPUT"
       {DOWN}{4}ARE YOU SURE [Y/
       N]";A$:IF LEFT$(A$,1)<>"Y
       "THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IFLE
       N(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$=M
       ID$(IN$,3):GOSUB320:AD=AD
       *256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID$(
       B$,J,1):B=ASC(A$)-C4+(A$>
       "@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=0:
       A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(H$
       ,B+1,1);:B=A-B*C6:PRINT M
       ID$(H$,B+1,1);:RETURN
RR 360 A=INT(AD/Z6):GOSUB350:A=A
       D-A*Z6:GOSUB350:PRINT":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       {4}";:GOSUB300:IF IN$<>N$
        THEN GOSUB1030:IF F THEN
       400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA ":
       GOSUB400:IF IN$=N$ THEN22
       0
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F T
       HEN PRINT IN$:PRINT"{UP}
       {5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$=S
       $:FOR J=1 TO 2:IF F THEN
       {SPACE}B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<24
       THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A$>
       "@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-3*
       (A$=".")-4*(A$="/")-5*(A$
       ="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":")
       -9*(A$="U")-10*(A$="I")-1
       1*(A$="O")-12*(A$="P")
CM 487 A=A-13*(A$=S$):IF A THEN
       {SPACE}A$=MID$("ABCD123E4
       56F0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J=1
       )OR F)THEN PRINT B$;:J=2:
       NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRINT
        B$:J=2:NEXT:I=24:NEXT:F=
       0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF THEN
       PRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR((
       I=0)AND(J=1))THEN GOSUB10
       60:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;:J
       =2-J:IF J THEN PRINT L$;:
       I=I-3
QS 540 PRINT A$;:NEXT J:PRINT S$
       ;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$:I
       F IN$=N$ THEN CLOSE3:GOTO
       220
QC 560 FOR I=1 TO 25 STEP3:B$=MI
       D$(IN$,I):GOSUB320:IF I<2
       5 THEN GOSUB380:A(I/3)=A
PK 570 NEXT:IF A<>CK THEN GOSUB1
       060:PRINT"{BLK}{RVS} ERRO
       R: REENTER LINE {4}":F=1:
       GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FOR
       {SPACE}I=0 TO 7:POKE B+I,
       A(I):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN CLO
       SE3:PRINT"{DOWN}{BLU}** E
       ND OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
```

```
QA 610 PRINT"{CLR}{DOWN}{RVS} DI
       SPLAY DATA ":GOSUB400:IF
       {SPACE}IN$=N$ THEN220
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAUSE,
        {RVS}RETURN{OFF} TO BREA
       K{4}{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FORI=
       BTO B+7:A=PEEK(I):GOSUB35
       0:GOSUB380:PRINT S$;
CC 640 NEXT:PRINT"{RVS}";:A=CK:G
       OSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA THEN
       PRINT"{DOWN}{BLU}** END O
       F DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GOSU
       B1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOSUB
       1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD DA
       TA ":OP=1:GOTO710
PC 700 PRINT"{DOWN}{RVS} SAVE FI
       LE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILENA
       ME{4}";IN$:IF IN$=N$ THEN
       220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}D
       {OFF}ISK: {4}";
FP 730 GET A$:IF A$="T"THEN PRIN
       T"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8,1
       5,"I0:":B=EA-SA:IN$="0:"+
       IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":GOS
       UB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(AH*
       256):PRINT#1,CHR$(AL);CHR
       $(AH);
PE 780 FOR I=0 TO B:PRINT#1,CHR$
       (PEEK(BS+I));:IF ST THEN8
       00
FC 790 NEXT:CLOSE1:CLOSE15:GOTO9
       40
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       {4}":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":GOS
       UB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z$)
       +256*ASC(B$+Z$):IF AD<>SA
        THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:POK
       E BS+I,ASC(A$+Z$):IF(I<>B
       )AND ST THEN F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F>0
       )+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN C
       LOSE1:CLOSE15:GOSUB1060:P
       RINT"{RVS}ERROR: "A$
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE18
       7,PEEK(FA+3):POKE188,PEEK
       (FA+4):IFOP=0THEN920
HJ 890 SYS 63466:IF(PEEK(783)AND
       1)THEN GOSUB1060:PRINT"
       {DOWN}{RVS} FILE NOT FOUN
       D ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(830
       ):IF AD<>SA THEN F=1:GOTO
       970
SC 910 A=PEEK(831)+256*PEEK(832)
       -1:F=F-2*(A<EA)-3*(A>EA):
       AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:POK
       E780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOSUB
       1010:ON OP GOTO950:SYS 63
       591
AE 940 GOSUB1080:PRINT"{BLU}** S
       AVE COMPLETED **":GOTO220
XP 950 POKE147,0:SYS 63562:IF ST
       >0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}** L
       OAD COMPLETED **":GOTO220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}{4}":ON F GOSUB980,
       990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTING
       {SPACE}ADDRESS (";:GOSUB3
       60:PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:AD
       =SA+AD:GOSUB360:PRINT D$:
       RETURN
FD 1000 PRINT"TRUNCATED AT ENDIN
       G ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH*2
       56):POKE193,AL:POKE194,A
       H
FF 1020 AH=INT(B/256):AL=B-(AH*2
       56):POKE174,AL:POKE175,A
       H:RETURN
FX 1030 IF AD<SA OR AD>EA THEN10
       50
HA 1040 IF(AD>511 AND AD<40960)O
       R(AD>49151 AND AD<53248)
       THEN GOSUB1080:F=0:RETUR
       N
HC 1050 GOSUB1060:PRINT"{RVS} IN
       VALID ADDRESS {DOWN}
       {BLK}":F=1:RETURN
AR 1060 POKE SD+5,31:POKE SD+6,2
       08:POKE SD,240:POKE SD+1
       ,4:POKE SD+4,33
DX 1070 FOR S=1 TO 100:NEXT:GOTO
       1090
PF 1080 POKE SD+5,8:POKE SD+6,24
       0:POKE SD,0:POKE SD+1,90
       :POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:POKE
        SD+4,0:POKE SD,0:POKE S
       D+1,0:RETURN
```

G

ON DISK!

The GEOS Collection

13 of *Gazette*'s Best Programs for GEOS and GEOS 128 Users On One Disk—

includes all documentation

$11.95 (including shipping and handling)

Super Printer Driver—near laser-quality printing for Epson, Star, and compatible dot-matrix printers
Skeet—outstanding arcade-style game that runs as a GEOS desk accessory
File Saver—run most any 64 program from GEOS
Help Pad—fast, easy online help via menu
Word Count—quick, easy-to-use tool that counts words in any *geoWrite* text file
Directory Printer—get complete GEOS directory printouts, including file size, author name, and even file comments
Quick Clock—large, readable clock and improved user interface
SlideShow—create and display impressive slide presentations
File Retriever—recover GEOS and standard Commodore files; compatible with any Commodore drive or REU
Screen Dumper—desk accessory that lets you dump screens to any printer
Font Grabber—instantly turn your favorite Commodore character sets into GEOS fonts
GeoPuzzle—intriguing, multidimensional brainteaser
GeoConverter—write GEOS applications with your favorite Commodore assembler

YES! Send me _____ copies of *The GEOS Collection*. I've enclosed $11.95 (including shipping and handling) for each copy.

Name _____

Address _____

City _____ State _____ ZIP _____

Amount _____

Sales Tax* _____

Total _____

Mail personal check or money order for $11.95* to

***The GEOS Collection* Disk**
P.O. Box 5188
Greensboro, NC 27403

*Residents of New York, Pennsylvania, and North Carolina add appropriate sales tax for your state. All orders must be paid in U.S. funds by a check drawn on a U.S. bank. Please allow 4–6 weeks for delivery. For delivery outside the U.S. or Canada, add $1 for surface mail or $3 for airmail.

DAMARK
INTERNATIONAL, INC.

ORDER TODAY!!
1-800-729-9000
THE "GREAT DEAL" CATALOG

ZENITH — TURBOSPORT 386 PORTABLE LAPTOP COMPUTER

- 80386 32-bit processor, 12/6 MHz (switchable).
- 40 MB (28ms) hard drive.
- One 3.5" 1.4 MB floppy disk drive. • 2 MB RAM.
- 100% IBM compatible.
- "Page-White" fluorescent backlit LCD display,10.5" viewing area.
- MS-DOS 3.21 included.
- Supports: MS OS/2 version 1.0, Xenix, and also Microsoft Windows/386 environments.
- Zero wait state.
- Socket for 80387 numeric co-processor.
- Internal modem. • Serial and parallel printer ports.
- Resolution: 640 x 400 pixels.
- 79-key full function detachable keyboard.
- Real time clock and calendar.
- "Fast" charge NiCad battery pack included.
- AC adapter. • Weight: 14.7 lbs.
- Dim.: 13.25"W x 14.75"D x 4.75"H.
- **One Year Warranty!**
- **Factory New & Perfect!**

Mfg. Sugg. Retail **$8,499.00**
DAMARK PRICE:
$2999
Item No. B-1748-128686
Insured Ship/Hand.: $19.00

PACKARD BELL — PACKMATE 286 COMPUTER WITH VGA COLOR MONITOR

America grew up listening to us. It still does.

An 80286 microprocessor, 2 disk drives and high resolution VGA color monitor make this computer a must--ideal for desktop publishing!

- 80286 microprocessor (operates at 12 MHz).
- One 3-1/2" 1.44 MB floppy drive.
- One 5-1/4" 1.22 MB floppy drive.
- 30 MB hard drive.
- 1 MB RAM on mother-board: expandable to 3 MB.
- Includes VGA 14" color monitor & VGA card.
- High res. monitor: 480 x 600, & 256 colors. • IBM compatible.
- AT compatible. • 8 expansion slots. • Dual FDD/HDD controller.
- 2 half height drive cavities exposed.
- 1 half height drive cavity enclosed.
- 2 serial ports. • 1 parallel port.
- System configuration in CMOS with battery back-up.
- Included software: MS DOS 3.3 & GW BASIC.
- 145W Universal power supply.
- Socket for 80287 co-processor on motherboard.
- Zero wait state. • **One Year Warranty!**
- **Factory New! Factory Perfect!**

Manufacturer's Suggested Retail: **$3,449.00**
DAMARK PRICE:
$1499
Item No. B-1748-132142
Insured Ship/Hand.: $39.00

MANNESMANN TALLY — DOT MATRIX PRINTER

- Print 132-column spreadsheets or other data.
- Shifts from continuous form paper to single sheets.
- Serial RS232C interface.
- Up to 360 dpi. • 128/255 characters.
- Made in West Germany.
- Model #: MT222.
- Dim.: 23.4"W x 14.6"L x 4.6"H.
- Weight: 26.5 lbs.
- **90 Day Warranty!**
- **Factory New! Factory Perfect!**

Mfg. Sugg. Retail **$999.00**
DAMARK PRICE:
$399
Item No. B-1748-131227
Insured Ship/Hand.: $29.00

LOGITECH — M8 HIGH RESOLUTION MOUSE W/ PAINTSHOW

- High resolution: 200 dots per inch.
- 100% Microsoft Serial Mouse compatible, fully supports Microsoft windows.
- Includes Paint showpaint program.
- Includes drivers and menu software for popular applications including DOS, Framework, Symphony, Super Calc 3/4, Word Perfect, Wordstar.
- Compatible with IBM PC, AT, PS/2 & 100% compatible systems.
- Includes 9-25 pin adapter.
- Exceeds 300 miles in a lifetime.
- Serial interface device.
- Two fully debounced control buttons.
- 6' flexible cable.
- UL approved FCC class B.
- Color: Light Gray.
- Dim.: 1"H X 3.7"L X 2.3"W.
- Weight: 2.9 oz. (w/o cable).
- **3 Year Warranty!**
- **Factory New & Perfect!**

Compare At: **$69.00**
DAMARK PRICE:
$29
Item No. B-1748-126989
Insured Ship/Hand.: $5.00

TELE VISION — FAX-PHONE-COPIER

- 9600 bps transmission speed with automatic fallback.
- 5 page auto document feeder.
- Coded 100 number speed-dial-memory.
- Super fast transmission speed of 15 seconds per page.
- Worldwide compatibility with all G3 faxes.
- Multi-function telephone. Auto-redial, speaker monitor, hands free dialing.
- Manual, automatic and delay answering modes.
- External telephone jack for remoteanswering.
- Desktop copier function.
- 32-character LCD of time, date, and serves as a prompter.
- Transmission I.D. prints your name, number, date and time on each page sent.
- Transmission delay for faxing documents after hours.
- Confirmation report.
- Model #: HF 300.
- **One Year Warranty!**
- **90 Day Labor.**

Manufacturer's Suggested Retail: **$1,184.95**
DAMARK PRICE:
$599
Item No. B-1748-132084
Insured Ship/Hand.: $12.00

FOR FASTEST SERVICE CALL TOLL FREE
1-800-729-9000
CUSTOMER SERVICE: 1-612-566-4940

VISA MasterCard DISCOVER

QTY	DESCRIPTION	ITEM #	S/H/I	PRICE

DELIVERY TO 48 U.S. CONTINENTAL STATES ONLY

FEDERAL EXPRESS **RUSH DELIVERIES** ONLY $6.95 plus normal S/H. Look for the plane & ask your operator to "ship it FedEx® Delivery Services".

SUB TOTAL	
in MN add 6% Sales Tax	
Total S/H/I	
GRAND TOTAL	

B-1748

NAME _____
ADDRESS _____
CITY _____ ST ____ ZIP ____
PHONE _____

☐ Check/Money Order ☐ VISA SIGNATURE _____
☐ MasterCard ☐ Discover CARD NO. _____ EXP. DATE _____

Send To: DAMARK INTERNATIONAL, INC., 6707 Shingle Creek Parkway, Minneapolis, MN 55430

Circle Reader Service Number 187

Classified

SOFTWARE

FREE PD & SHAREWARE. C64 Send 1 stamp for catalog or $1 for 30 samples and catalog. RVH Publications, 4291 Holland Rd., Suite 562-G, VA Beach, VA 23452

FINEST C-64/128 PUBLIC DOMAIN SOFTWARE! New catalog of over 3000 programs. As low as $1.25 per disk of programs. $2.00 gets sample disk & catalog (on disk) mailed 1st class. **KOALA ENTERPRISES,** Dept. GZ, Rt. 2 Box 677, Carencro, LA 70520

ATTENTION C-128 OWNERS. Quality business and educational software and games for the C-128 (not C-64 mode). For info, send SASE to MapGen Computer Systems, P.O. Box 2334, Dale City, VA 22193

FREE PUBLIC DOMAIN SOFTWARE - Request free catalog or send $2 for sample disk and catalog (refundable). C64-128. CALOKE IND., Dept. JK, Box 18477, K.C., MO 64133

FREE COMMODORE CATALOGS: 1-800-359-2189 Virus-free Amiga & 64/128 Shareware/PD disks. Buy 5-Get 1 Free! CALIFORNIA Freeware. 1747 E. Ave. Q Unit C-1, Palmdale, CA 93550

C128 and C128D Exclusive Software. Order "The Banker" complete checkbook software. Only $19.95. EasyLife Software Systems, PO Box 776, Tinley Park, IL 60477-0776

THOUSANDS OF PD PROGRAMS FOR C64/128! We have Games, Utilities, Music and much more! For information write: Lightspeed Software, PO3 340427, Tampa, FL 33694

Complete how-to users guide, beginners thru disassembler. w/ tutorial mag. All for $9.95 + $2.00 p/h. **CP/M 3+ Manuals Sent: Public Domain Software Copying Company, 33 Gold St., Ste. 13, New York, NY 10038** **800-221-7372**

COMMODORE: TRY BEFORE YOU BUY. Best selling games, utilities, educ'l + classics & new releases. 100's of titles. Visa/MC/Disc Free brochure. RENT-A-DISC, Frederick Bldg. #222, Hunt'n, WV 25701 (304) 529-3232

WIN LOTTO MILLION$! LOTTO PICKER PLUS v2.1 Lotto Picker Plus, the original lottery selection software, allows you to store winning Lotto, Keno, & Pick 3/4 numbers & choose between three modes of probability analysis (hot, due, unbiased) in order to give you the winning edge! Guaranteed to work for all lotteries. Bonus numbers are easily handled and our full-featured database editor gives you access to your files. We give you the PICKS—not a bunch of jumbled statistics **$39.95** (+$2.55 s/h). 3.5" add $5. 64/128, IBM, 64K Apple II. NY res. add tax. NOT copy-protected. **ORDER TODAY! 1-800-634-5463 ext 293** (M-F 8-5) **GE RIDGE SERVICES, INC.,** 170 Broadway Suite 201-CG, New York, NY 10038 Info/Dealers 718-317-1961

RENT 64/128 SOFTWARE! 1000's of disks. Lowest prices. No deposit or fee. Free catalog. Centsible Software, PO Box 930, St. Joseph, MI 49085 (616) 982-0327.

C64/128 PD SPECIAL! 15 DISKS PACKED FULL of Games, Music, Util., Educ., Hm/Bus. for $25 +$2.50 s/h. For more info send SASE. D & V CompSoft, PO Box 933, Ardmore, TN 38449

*****JOYSTICK WARRIORS!** Suit up for real adventure on your C64/128. Write for free information: **AERION SOFTWARE, LTD.,** P.O. Box 1222, Riverdale Station, NY, NY 10471

FREE CATALOG FOR COMMERCIAL SOFTWARE 30-60% off. Amiga Apple, Commodore & IBM, MacIntosh, Atari. DISK-COUNT SOFTWARE, Box 3, Carteret, NJ 07008. (800) 448-6658

MUSIC LOVERS! MIDI YOUR C64/128. We have music software, Midi interfaces, hundreds of pre-programmed songs. Catalog-$1.00. MIDI Inn, Box 2362CG02, Westmont, IL 60559

Thousands of C64/128 PD programs on 400+ disks. Free listing or $1 large catalog. DISKS O'PLENTY INC., 7958 Pines Blvd., Suite 270A, Pembroke Pines, FL 33024

TAX PACKAGE FOR C64, C128 (in 128 mode), & Plus/4 $19.95+$2 s/h. Forms 1040, 1040A, A,B,C,D,E,F,SE,2106,2441. Yearly updates $10. Prints IRS forms! Steve Karasek, 855 Diversey, Crestwood, MO 63126 (314)961-2052

C64/128 FINEST PUBLIC DOMAIN PROGRAMS Pretested quality programs * Most $1.50 * *On Disk * YOU pick the programs that YOU want!!! Free diskfull of programs with first order! For a list + Description send SASE to: JLH Co., Dept. G, Box 67021, Topeka, KS 66667

C64, C128 & CP/M PUBLIC DOMAIN SOFTWARE Free Catalog, fast service, low prices, & unbelievable specials. ComputerActive, Box 893-C, Clinton, OK 73601

COOK BOOK & RECIPE CALCULATOR $14.95 Over 130 recipes, calculates any amount, and English-metric conversion. Microcraft, PO Box 1181, Lisle, IL 60532

HARDWARE

KASARA MICROSYSTEMS 1-800-248-2983 10 YEARS in business. COMPETITIVE PRICES on Commodore ICs & Apple Boards plus accessories, power supplies.

COMPUTER REPAIR

Authorized Commodore Repair Center. All Comm. products repaired, free UPS. 48-hr turnaround based on parts avail. Software City, 901-C N. Wendover Rd., Charlotte, NC 28211 (800) 522-4789

Authorized Repairs C64/128: $50 & $55; 1541/ 1571: $55 & $65; SX64, 128D, Amiga, PC: $Call 816-425-4400. Selling: DTK-IBM compatible computers. Quick Serv. 30 day warranty. We buy, sell, trade. MOM & POP's COMPUTER SHOP, 114 N. 16th, Bethany, MO 64424

C-64 REPAIR $39.95 FLAT RATE. 1541/1571-$49.95;SX64-$69.95;128-$64.95. 24 Hr turn-around. 90 dy warranty. A&M Computer Repair, 20 Guernsey, New Windsor, NY 12550, 914-562-7271

BULLETIN BOARDS

NEW C64 BBS! ELITE GAMES OVER THE PHONE. The Software Continuum contains 20 megs of online games, bulletins, game reviews and the newest and hottest titles (140) 24 hours \ 300&1200 baud \ (804) 443-5190

EDUCATION

B.Sc. & M.S. in COMPUTER SCIENCE

The American Institute for Computer Sciences offers an in-depth correspondence program to earn your Bachelor of Science and Master of Science degrees in Computer Science at home. BSc. subjects covered are: MS/DOS, BASIC, PASCAL, C, Data File Processing, Data Structures & Operating systems. MS program includes subjects in Software Engineering and Artificial Intelligence.

AMIERICAN INST. for COMPUTER SCIENCES
1704-CG 11th Avenue South
Birmingham, AL 35205
TOLL FREE 1-800-767-AICS

COMPUTE!'s Gazette Classified is a low-cost way to tell over 200,000 microcomputer owners about your product or service.

Rates: $25 per line, minimum of four lines. Any or all of the first line set in capital letters at no charge. Add $15 per line for boldface words, or $50 for the entire ad set in boldface (any number of lines.) Inquire about display rates.

Terms: Prepayment is required. Check, money order, American Express, Visa, or MasterCard is accepted. Make checks payable to COMPUTE! Publications.

Form: Ads are subject to publisher's approval and must be either typed or legibly printed. One line equals 40 letters and spaces between words. Please underline words to be set in boldface.

General Information: Advertisers using post office box numbers in their ads must supply permanent address and telephone numbers. Orders will not be acknowledged. Ad will appear in next available issue after receipt.

Closing: 3rd of the third month preceding cover date (e.g., June issue closes March 3rd). Send order and remittance to: Kathleen Ingram, Classified Manager, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. To place an ad by phone, call Kathleen Ingram at (919) 275-9809.

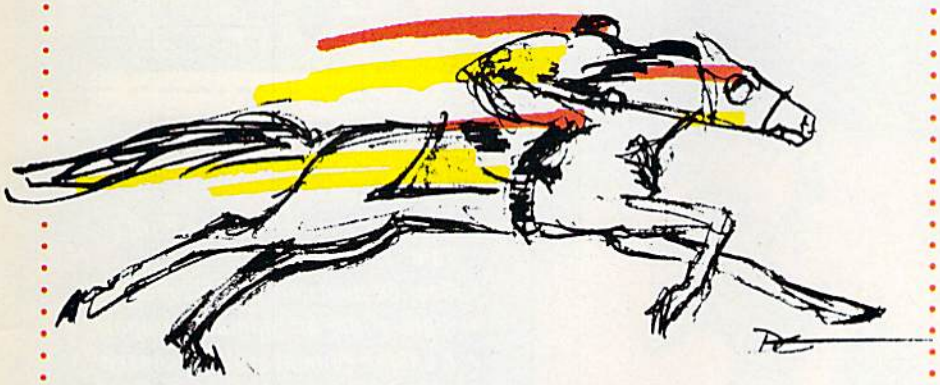
Notice: COMPUTE! Publications cannot be responsible for offers or claims of advertisers, but will attempt to screen out misleading or questionable copy.

Classified Display Rates: Classified display ads measure 2¼" wide and are priced according to height. 1" = $250; 1½" = $375; 2" = $500; 3" = $600; ($100 for each additional inch, e.g. 4" = $700, etc.) Preferred supplied material is Velox or PMT.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Edited by Mickey McLean



And They're Off!

Fast on the heels of its release of the popular sports simulation, *Omni-Play Basketball*, SportTime Computer Software (3187-G Airway Avenue, Costa Mesa, California 92626) has announced the availability of *Omni-Play Horse Racing* ($34.95) for the Commodore 64.

Up to four players can compete, making computer wagers on 128 horses at each track. Before you make your bets, you can handicap each horse by studying sources that list each horse's performance in the last ten races and profiles of each jockey. You can also purchase tips from reliable and sometimes shady sources. Track conditions must also be taken into consideration. Tournament rules are determined by you. A joystick is required.

Lights! Camera! Action! Arcade!

Coming soon to a Commodore 64 near you, the latest release from Hollywood. The most recent translation from the silver screen to the computer screen is *Indiana Jones and the Last Crusade* ($29.95) from Lucasfilm Games. It's distributed by Electronic Arts (1820 Gateway Drive, San Mateo, California 94404).

This three-level arcade game follows the same plot as the movie. The game begins in 1912 in Utah, with the young Indy trying to rescue the Cross of Coronado from a gang of grave robbers. If you're successful in retrieving the cross, you must make your getaway by jumping from car to car of a circus train while dodging knives, fists, and circus animals.

In level 2, you'll find yourself in the Venetian catacombs where the Grail Knight's shield must be found. Obstacles to your quest include fireballs, rats, and crumbling masonry. Succeed and you'll get to scale the walls of the castle, Schloss Brunwald, while dodging searchlights, lightning bolts, and falling rocks. You must learn to use Indy's whip to swing from ledge to ledge searching for Indy's dad, Henry.

When you reach the interior of the castle, you're ready for level 3. As Indy, you must prowl the catwalks of a giant Zeppelin, looking for a crucial key to the Grail puzzle while punching out Nazis. If you can make your way through the maze and sabotage the alarm system, you'll move on to the final challenge—the Grail Temple.

If you've seen the movie, you'll be familiar with the Temple's three trials. Your challenge is to survive and reach the Holy Grail before Henry's heart beats its last. Your score increases with every hazard dodged, valuable object found, and enemy defeated.

The *Action Game* features music from the movie and game graphics based on movie stills. Lucasfilm was also careful to capture Indy's walk.

Tax Time

The 1989 version of *Tax Master* 20 ($32) has been released by Master Software (6 Hillery Court, Randallstown, Maryland 21133). This Federal Income Tax preparation program covers all new tax laws and guides you through Forms 1040 and 4562, and Schedules A–F. *Tax Master* features built-in tax tables and can perform all calculations, figuring your tax automatically. It can also transfer results from one tax form to another.

Other features include a built-in calculator that can be accessed at any point in the program. The calculator's results can be transferred directly to the line of the tax form that you're working on.

The menu-driven program allows all data to be stored to and retrieved from disk, so that you can update a preliminary estimate as more information, such as W-2 forms and bank interest statements, becomes available. A file-coding system built into the program allows data for several taxpayers to be stored on one disk. Data from all forms can be either displayed onscreen or printed out.

RAM Up to 128K

Brown Boxes (26 Concord Road, Bedford, Massachusetts 01730) has introduced the QBB-B ($119), a battery-backed cartridge enhancement for the 64 and 128. If you own the 64K Quick Brown Box, this 64K cartridge allows you to upgrade to 128K of program and data capability that remains intact even after the computer is turned off.

The QBB-B is the same size as the QBB and can be run on an extender card. Software included with the package makes the pair of cartridges appear and act as one contiguous 128K cartridge. The pair of cartridges can be set to operate in 64 or full 128 mode.

Brown Boxes is offering $20 off or a free Aprospand 64 extender card if the QBB-B is purchased with a regular 64K QBB.

Bard's Tale™ Fans Rejoice!

Dragon Wars™

Most of the creatures you meet are as friendly as this guy. He wants to take his spear and shishkabob your whole party.

- **Supports characters from Bard's Tale™ I, II & III**
- **Over 60 monsters and 65 spells**
- **State-of-the-art animated graphics**
- **A unique combat system: choose complexity of combat resolution, determine spell strength, select tactics of ranged combat**
- **An easy-to-use pop-up window system**
- **Save the game anywhere**
- **A paragraph book for enhanced storytelling**
- **Automap keeps track of your every move; no graph paper needed**

Actual Apple IIe screen. Available for the Apple IIc/e/ IIGS & C64; Coming soon MS-DOS & Amiga

In a hundred years hacking will get you killed.

Best Computer Adventure — *Video Game & Computer Entertainment*

Named Top Adventure — *Computer Gaming World*

Available for C64, Amiga, MS-DOS, Apple series. Cluebook available.

1989 SPA Graphics Award Winner

Best Strategy Game of the Year — *Amiga User*

Available for C64, Amiga, MS-DOS, Atari ST, Apple IIGS.

COMING SOON FROM INTERPLAY: MEAN TIME™
A time-travelling epic for the Apple II series & C64.

To order these games direct: 1-800-969-GAME

Neuromancer is a trademark of Cabana Boy Productions. Bard's Tale is a trademark of Electronic Arts. Amiga and Commodore are trademarks of Commodore Business Machines. Battle Chess, Dragon Wars and Mean TIme are trademarks of Interplay Productions.

Interplay™

1575 Corporate Drive
Costa Mesa, CA 92626

MEDALIST MONITOR Special Edition

VOL. 305 NO. 122 HUNT VALLEY, MARYLAND 25 CENTS

"Madness in Murderworld"

PROFESSOR X KIDNAPPED! X-MEN RUSH TO RESCUE!

Famous Mutant Telepath Feared Captured By Arch-Nemesis Magneto and Evil Genius Arcade

NEW YORK, NY (MP) — Professor Charles Xavier, founder of the world-renowned mutant crime-fighting group known as the X-Men, has been kidnapped by his arch-rival Magneto, according to unconfirmed reports. "Professor X," as he is commonly known, is reportedly being held in Murderworld, a lethal amusement park of terror designed by the evil genius Arcade.

Although the X-Men refuse to comment on the rumor, sources close to the group claim that Magneto, the mutant master of magnetism, has abducted Xavier in an attempt to lure the X-Men to Murderworld. A source wishing not to be identified also stated that six of the most powerful X-Men — Cyclops, Storm, Wolverine, Colossus, Nightcrawler and Dazzler — are preparing a rescue effort.

But according to Chief of Police F.J. Seremet, infiltrating Murderworld is no easy task. "Arcade designed Murderworld as an assassination tool, and he's fortified it with more traps and tricks than you can imagine," he said. "But the most dangerous part of Murderworld is the Fun House, and I'd bet my life that's where the Professor is."

Seremet refused to confirm the rumor that Magneto and Arcade have also enlisted the aid of other evil mutants in their attempt to destroy the X-Men. Among the Super Villains said to be involved in the Murderworld plot are Blob, the Silver Samurai, the White Queen, Nimrod and Avalanche. The mutant-hunting Sentinels are also allegedly under Magneto's control.

"If those evil mutants are a part of this, there's going to be madness in Murderworld," Seremet said. "Not only are the X-Men going to have to deal with all of Arcade's dangerous tricks and obstacles, but they're going to be fighting other evil mutants at every turn. The only chance they've got is if the group can make successful use of each member's individual powers. If just one of the X-Men dies, though, it's all over."

Not much is known about Murderworld or its Fun House "attraction." Arcade himself, however, in a rare interview granted recently to *Super Villain Quarterly*, revealed that the Fun House consists of over 25 individual levels and about 500 rooms — most of them packed with surprises for the unwary. Surviving the Fun House, he said, requires extreme resourcefulness, ingenuity, and not a little courage and imagination.

"It's the ultimate challenge," Arcade said in the article. "I dare anyone to conquer it."

JESS ARMSTRONG

Although the X-Men refuse to acknowledge that a rescue attempt is being mounted, the Medalist Monitor *has obtained these exclusive photographs of several members of the group battling Magneto's allies. It is also believed that Professor X (below left) has communicated telepathically with his team at least once.*

Who Are The X-Men?

The X-Men are mutants born with strange powers that separate them from "normal" human beings. Their exploits have been chronicled in Marvel Comics since 1963. Here is a list of the six X-Men believed to be undertaking the rescue of Professor Xavier.

Cyclops	The leader of the X-Men. His eyes release concentrated blasts of pure energy.
Storm	Can control the weather itself, from driving rain to searing bolts of lightning.
Wolverine	A mutant fighting machine with adamantium claws that can shred steel.
Colossus	Can turn his skin into organic steel at will.
Nightcrawler	His misshapen body provides uncanny dexterity and climbing abilities. He can also teleport anywhere instantly.
Dazzler	Transforms sonic vibrations into awesome beams of focused light.

NEW FROM MEDALIST INTERNATIONAL

A marketing division of MicroProse Software, Inc.
180 Lakefront Drive • Hunt Valley, MD 21030

PARAGON SOFTWARE

Can't find *X-Men: Madness in Murderworld*? Call 301-771-1151 ext. 208 weekdays 9 am to 5 pm Eastern Time and order by MC/Visa/AmEx. Or mail check or money order for $39.95 for IBM-PC/Tandy compatibles version (specify disk size). MD residents add 5% sales tax. Free shipping in US; $5 international. US funds only. The X-Men and other Marvel characters and the distinctive likenesses thereof are trademarks of Marvel Entertainment Group, Inc. and are used with permission. Copyright © 1989 Marvel Entertainment Group, Inc. All Rights Reserved. *X-Men: Madness in Murderworld* is produced under license from the Marvel Entertainment Group, Inc.

Circle Reader Service Number 200

DESK TOP STUFFING.

Konami is cooking now, with a hot computer game that gives you complete control of world championship caliber basketball, featuring Chicago, New York, Boston and LA.

From the opening tip, it's 5 on 5, full court, board crashing action, highlighted by blocks, steals, picks, foul shots, 3 point bombs and 3 kinds of slams—the Gorilla, the Rim Rockin' Reverse and the In-Your-Face Jam!

Two can play at this game, or you can challenge the computer. Either way, it'll take all the runnin' and gunnin' you can muster if you hope to savor the taste of victory.

KONAMI®

"Konami® is a registered trademark of Konami Industry Co., Ltd. Double Dribble™ is a trademark of Konami Inc. © 1989 Konami Inc. Amiga® is a registered trademark of Commodore-Amiga, Inc. IBM® is a registered trademark of International Business Machines, Inc. Commodore® is a registered trademark of Commodore Electronics Ltd.

Double Dribble is available for IBM. Also Commodore and Amiga in early 1990.

Circle Reader Service Number 130